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Apertus joins client/server, legacy camps

By Wayne Eckerson
Senior Editor

EDEN PRAIRIE, Minn. — Apertus Technologies, Inc. last week announced server-based middleware that transparently manages connections between client/server applications and legacy systems.

Called Enterprise/Access, the software runs on Unix servers and enables Microsoft Corp. Windows, OS/2 and Unix applications to access and update host programs using terminal-emulation, SQL or peer-to-peer communications methods.

Enterprise/Access provides a point-and-click graphical development environment that makes it easier to establish links between legacy and client/server applications. It also contains a Motif-based systems management module that monitors and controls networks of Enterprise/Access servers and connections between applications.

"Enterprise/Access offers a scalable, high-performance way for companies to build enterprisewide client/server applica-



PHOTO ©1993 STEVEN BORNIS

Founder Michael Fields explains OpenVision's mission.

There's the rub: Cabletron to integrate router, hub

By Skip MacAskill
Senior Writer

ROCHESTER, N.H. — Cabletron Systems, Inc. this week will deliver on the second phase of its ATM plan with the introduction of a module that routes traffic between ATM nets and traditional LANs, according to industry sources.

Ultimately, the company plans to integrate the Asynchronous Transfer Mode routing technology, which it developed internally, into the basic architecture of all of its hubs, including its fixed-port low-end devices. The technology will debut in a slide-in

module for the company's flagship Multi Media Access Center (MMAC) intelligent hub.

The router integration plans run counter to claims by SynOptics Communications, Inc. and Cisco Systems, Inc. that routing and hubs are better kept apart.

"SynOptics and Cisco have essentially said that tightly integrating routing in the hub was not

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Top guns back new management vision

OpenVision allies with HP, IBM, OSF and others in targeting distributed systems management.

By Jim Duffy
Senior Editor

NEW YORK — Pledging to slay the dragons holding open systems at bay, start-up OpenVision last week marched into the world of client/server systems management.

OpenVision burst on the management scene armed with 15 applications and backed by an impressive roster of customers and business partners. The company has its sights set on overcoming what it claims is the biggest impediment to widespread implementation of open, client/server computing: lack of cohesive, mainframe-class products addressing operations, performance, storage and security management.

The firm unveiled a rash of products that address those functions and disclosed systems man-

agement technology-sharing alliances with Hewlett-Packard Co., IBM, the Open Software Foundation, Inc. (OSF), Tivoli Systems, Inc. and Unix System Laboratories, Inc. (USL).

OpenVision has been at work on the products since it was founded last July in Pleasanton, Calif., by Chairman and Chief Ex-

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Software Test Series finds Banyan's ENS offers good directory assistance. Page 40.



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HP APPLICATION SUITE bolsters OpenView systems management capabilities. Page 4.

Winds of change sweeping over cooped-up 800 world

Carriers wage war of numbers on defections.

By Bob Wallace
Senior Editor

Users began jumping from carrier to carrier like frogs among lily pads last week as the long-awaited dawn of portability broke across the \$7 billion 800-services market.

AT&T said 10,000 users representing more than \$140 million in revenue are switching their 800 numbers to the company, while MCI Communications Corp. claimed 6,550 users representing over \$170 million have agreed to migrate their 800 numbers to MCI. Sprint Corp. said it anticipates winning several thousand customers because of

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Survey shows users ready to make the leap.

By Daniel Briere
and Mark Langner
Special to Network World

According to a *Network World*/TeleChoice, Inc. survey of large companies, decision makers are already exercising their right to switch 800-service providers under the new portability rules.

Survey findings lend credence to claims made by AT&T and MCI Communications Corp. that thousands of users switched 800 carriers last week. Indeed, of the 101 *Network World* readers surveyed, 36.6% report that they have already decided to switch or are seriously considering a

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MoNet paints rosy picture of the future

By Ellen Messmer
Senior Correspondent

NEW YORK — Motorola, Inc. last week laid out plans for a networking technology that, if widely adopted, would break down the barriers between incompatible wireless data services and make it easier for mobile users to work on the road.

Motorola's MoNet — for Mobile Networks Integration Technology — would simplify sign-on to network services and allow mobile users to transparently send data and messages across any wireless service that supports the technology. It would also help in integrating wireless and wireline services, as well as sim-

(continued on page 59)

AT&T expected to unveil powerful switch software

Version 2 of the PBX pack will provide common advanced features to Definity Generic 3 line.

By Bob Wallace
Senior Editor

NEW ORLEANS — AT&T is expected to announce at its Definity/System 85 Users Group meeting here this week a new software release that will boost the call processing, station capacity and data handling features of its Definity Generic 3 (G3) switches.

The new private branch exchange software, Version 2, will bring advanced features to everything from the 40-60-line Definity Generic 3 VS (G3VS) to the high-end Generic 3r, which today supports as many as 10,000 lines.

"This is the next step in the

evolution of the Definity PBX," said an analyst briefed on the software by AT&T who requested anonymity. "By doing this, AT&T is supporting a common set of features across all its G3 PBXs."

Mark Koenig, market segment director for AT&T's General Business Communications Systems unit said, "We wanted to develop a single software load for the G3 that can be used here and internationally. This will assure multinationals that they can build networks across country borders."

Version 2 will be available in June, the spokeswoman said.

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Banyan takes strides in meeting customer needs

Announces VINES for HP/UX, direct support, more.

By Caryn Gillooly
Senior Editor

SAN FRANCISCO — The earth rumbled here last week, not from a natural disaster, but rather from the sound of users applauding the announcement of long-awaited products and statements of direction from Banyan Systems, Inc.

Topping the list of announcements was, as expected, an agreement between Banyan and Hewlett-Packard Co. to codevelop, market and support a version of VINES that will run on HP's Precision Architecture-Reduced Instruction Set Computing (RISC)

hardware under the HP/UX Unix-based operating system (NW, April 26, page 5).

But the unannounced was almost as equally important when details came to light about future RISC platforms that will be able to run within VINES, and when executives discussed a new Systems Network Architecture gateway product (see story, page 60).

Other announcements at the Association of Banyan Users International (ABUI) '93 conference here included two new support programs that give users direct support from Banyan engineering.

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Forms-based work flow gaining some momentum

By Wayne Eckerson
Senior Editor

BOSTON — There is a move afoot by work group computing vendors to eliminate perhaps the most ubiquitous fixture of the office: the business form.

In the next two months, Delrina Technology, Inc., Microsoft Corp. and WordPerfect Corp. will ship work flow software that automates the design, distribution and management of such business forms as expense reports and purchase orders.

"Forms-based work flow products will be a big hit among business managers," said John

Donovan, director of the business groupware services at WorkGroup Technologies, Inc. in Hampton, N.H. "[The products] provide an immediate, definable payback because they support information flows more reliably, efficiently and with fewer mistakes than paper processes. The decision to use it is a no-brainer."

Forms-based work flow products can be divided into two basic camps: those that are tightly integrated with electronic mail and support extensive routing, and those that offer tight integration with back-end databases.

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Briefs

Motorola issues outsourcing RFP. Electronics giant Motorola, Inc. is considering outsourcing its domestic voice and data networks in an effort to reduce costs. According to industry sources, the company handed out its outsourcing requirements in a request for proposal at a meeting held in Schaumburg, Ill., on April 23, attended by at least 10 of the country's top outsourcing firms.

Apple forges new DAL links. Apple Computer, Inc. this week is expected to deliver on its year-old promise to develop an Open Database Connectivity (ODBC) driver for its Data Access Language (DAL) connectivity software. Apple's DAL and Microsoft Corp.'s ODBC are similar but competing methods for linking desktop applications to multivendor corporate databases. At the DB/EXPO '93 show, Apple and Microsoft will unveil a software developers' kit for writing DAL-compliant applications that can link to ODBC-supported databases.

FCC nixes LEC charges. The Federal Communications Commission last week rejected the local exchange carriers' proposed new tariffs for database lookups and support services to be used by interexchange carriers under 800 portability, which became effective May 1. Users and interexchange carriers had complained that the local exchange carrier charges were too high. The FCC ordered the local exchange carriers to file tariff revisions, recalculating their costs under FCC-imposed guidelines. The agency also opened a general investigation of price factors that the local exchange carriers covered via price cap regulations figured into their rates.

DEC FDDI prices dive. Digital Equipment Corp. last week said it cut the price of its Fiber Distributed Data Interface products by as much as 43%. The cuts affect DEC's Ethernet-to-FDDI bridges, single- and dual-attach FDDI adapters, and concentrators.

McCaw reorganizes around CDPD. McCaw Cellular Communications, Inc. last week announced the formation of a Wireless Data Division that will develop and provide wireless data services using cellular digital packet data (CDPD) technology. The division plans to deploy a CDPD-based wireless data network in more than 105 markets already served by McCaw, starting with Las Vegas in August and extending nationwide by mid-1994. CDPD is a technology for shipping digital data packets across analog cellular connections.

EDGAR goes on-line. Government rules mandating the electronic filing of financial reports to the Securities and Exchange Commission took effect last week, requiring the first group of 500 companies to file documents electronically with the SEC's Electronic Data Gathering, Analysis and Retrieval (EDGAR) System. The SEC will add additional groups of electronic filers in July, October and December, followed by a congressional review of the procedure. All 15,000 publicly held U.S. firms are expected to use EDGAR by the end of 1996.

IBM is early with MPTN code. IBM announced last week that the MVS version of its Multiprotocol Transport Networking (MPTN) software, now dubbed AnyNet/MVS, is now available — almost two months ahead of schedule. Products employing MPTN contain mapping techniques and algorithms that enable applications to use any underlying transport protocol. It is available for a monthly lease price of between \$254 to \$2,350, depending on processor size.

CONTACTS

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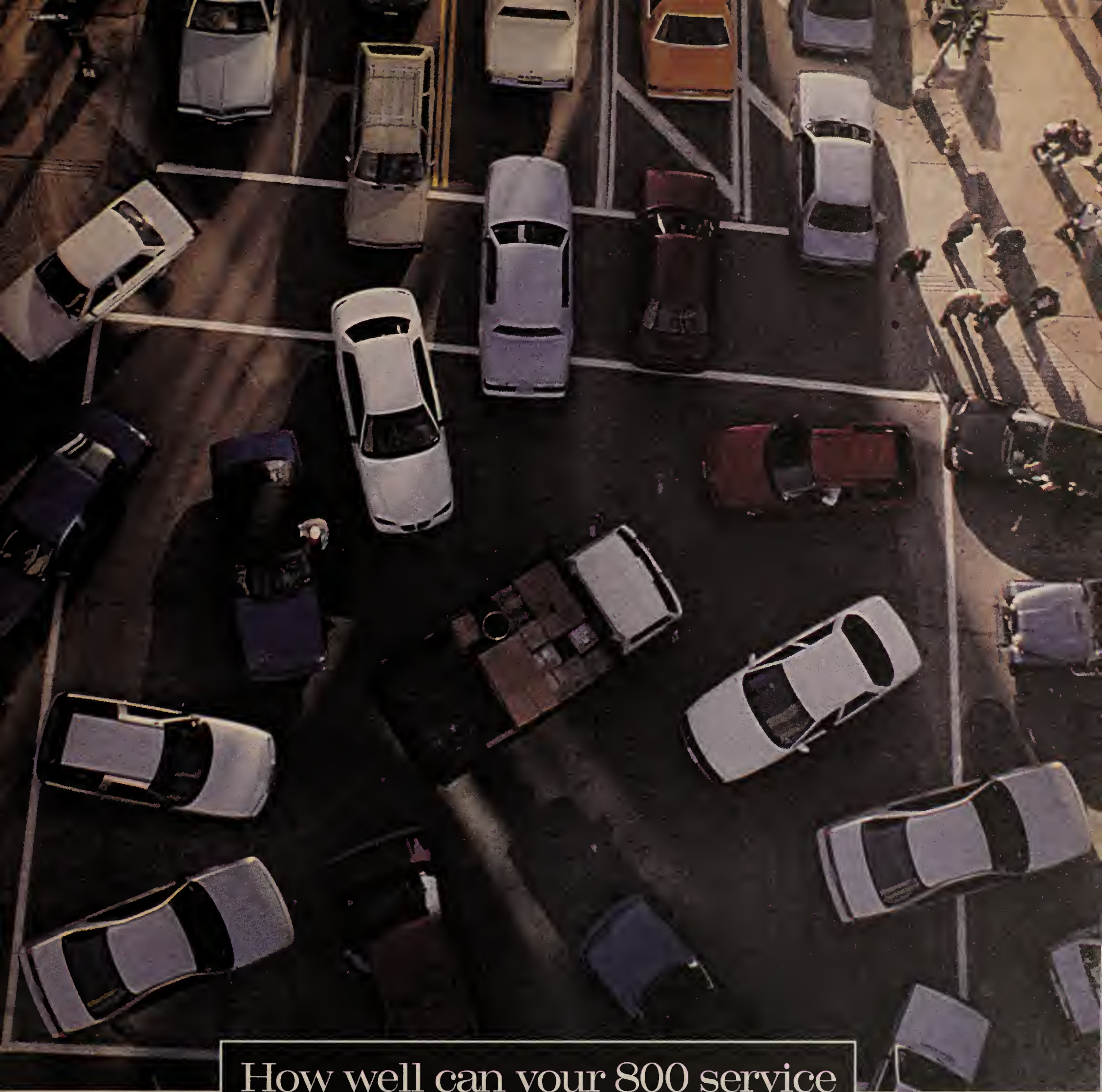
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Upcoming Oracle databases to boast object capabilities

Company chief announces several joint ventures.

By Cara Cunningham
IDG News Service

SAN FRANCISCO — The future of Oracle Corp.'s namesake database is filled with objects, Larry Ellison, company CEO and president, told attendees of Oracle's CODA '93 conference here yesterday.

Oracle will evolve its relational Oracle 7.0 database into an object-oriented SQL database, which Ellison referred to as Oracle 8.0. Using an object-oriented version of SQL that Ellison dubbed SQL++, Oracle will break the limitations of current relational databases by creating a product capable of storing data as objects instead of in tables.

"I'm an object bigot," Ellison said. "I'm disappointed in Oracle 7's lack of object capabilities." With Oracle 8, the company will use SQL++ to add a "schema layer" on top of the database so documents can be stored in an object-oriented form, which makes

them easier for users to identify, he continued.

Oracle will also add object-oriented application program interfaces to Oracle 8 that will make writing applications for the future database easier. And Ellison said the company will enhance its programming tools to deal with objects directly.

Wayne Kernochan, director of commercial systems research at Aberdeen Group, Inc., a consulting firm in Boston, said Oracle's plan makes sense.

"A question facing all the [relational DBMS] vendors is what to do about object technology," Kernochan said. "Objects are the next big source of data that their databases are going to have to handle."

Other priorities for Oracle 8 include enhanced ease of installation and administration, Ellison said.

"Our goal is to make it as easy as the Mac file system." Version 8

will also feature automatic recovery and backup so corporations can run their applications 24 hours a day, seven days a week, he said.

Even before Oracle 8 is released, which will be by year-end 1994, Oracle plans to roll out Oracle 7.1. This version, due in October, will add the ability to perform parallel queries, Ellison said.

"I'm disappointed in Oracle 7's lack of object capabilities," Ellison said.

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Ellison also gave conference goers a glimpse at Oracle's strategy for dealing with other new technologies, such as mobile computing.

"I don't think you want a database running on a notebook," he said. Instead, the company is developing "single-user object" (continued on page 59)

HP to launch database replication server at show

By Bob Brown
Senior Editor

SAN FRANCISCO — Hewlett-Packard Co. this week will introduce a database replication system that handles distribution of data across multiple HP Allbase/SQL databases on a network.

The announcement will come at the DB/EXPO '93 conference here, where HP will also unveil its OpenWarehouse strategy and the first products supporting that plan. OpenWarehouse products will aid in managing and accessing data on HP 9000 Series 800 servers and legacy systems.

While HP officials declined to provide details on HP OpenWare-

ers, Inc., whose Enterprise Data Access/SQL database connectivity software will be used to give desktop users running HP's NewWave Access a link to warehoused and operational data.

HP's new Allbase/Replicate software will be an add-on to Allbase/SQL, enabling a primary database to issue updates to one or more shadow databases at predetermined intervals. The software can replicate the entire database or just portions of it.

Allbase/Replicate can be used to update on-line databases and those on systems that do not run continuously. The latter can be synchronized with the primary database when they are brought back on-line.

For distributing databases and database backup, replication is an alternative to two-phase commit technology that, to date, has been implemented by vendors on a wider scale.

While two-phase commit is a popular option for updating time-sensitive data, it can be expensive and requires that all sending and receiving databases be available for updates before any updates can be made across a net.



Wilde

"Replication is a good technical path for HP," said Richard Finkelstein, president of Performance Computing, Inc., a Chicago consulting firm. "It allows users to implement a distributed database environment without taking too much risk."

Software AG of North America, Inc. and Sybase, Inc. are the other major database vendors that support replication, he said.

Allbase/Replicate comprises replication engine software, which resides on each database server, and a re-synchronization application that can be purchased from HP or third-party developers.

Dave Wilde, product planning manager for HP, said Allbase/Replicate offers Allbase/SQL additional fault tolerance by automating the process of backing up data on other machines. The software can also reduce network traffic by enabling administrators to copy data, including read-only data, to remote sites.

Allbase/Replicate, scheduled to ship in June, will cost \$6,800 to \$19,900 on the HP 9000 Series 800 server and \$2,400 to \$23,400 on the HP 3000 900 Series server. A price has not yet been set for a version of the product that will run on the HP Apollo 9000 Series 700 workstation. □

HP: (800) 637-7740.

UB plans to hitch its Unix wagon to HP's OpenView

By Skip MacAskill
Senior Writer

SANTA CLARA, Calif. — Ungermann-Bass, Inc. this week will roll out the first Unix version of its NetDirector net management system that will run on Hewlett-Packard Co.'s OpenView enterprise management platform.

The announcement comes on the heels of a move by UB rival SynOptics Communications, Inc., which essentially endorsed IBM's NetView/6000 platform last month (NW, April 5, page 4). Although both UB and SynOptics have not ruled out working with other platform vendors, the moves indicate where priorities lie.

According to Cheryl Hetrick, industry analyst at Business Re-

search Group, a market research firm in Newton, Mass., UB made the right decision.

"As a company, IBM might have more penetration, but HP provides more coverage with OpenView in terms of what the product can look at, and HP is better at partnerships than IBM," she said. "IBM may have an advantage in tying in the SNA world, but the number of users growing up from the PC LAN side is greater than the number pushing down from the legacy side."

In addition to unveiling NetDirector for Unix, UB will announce that it has teamed with HP on a joint development and marketing deal that will result in future products based on distrib-

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Conference package ties PCs together

By Bob Brown
Senior Editor

STAMFORD, Conn. — Fujitsu Networks Industry, Inc. last week announced a Novell, Inc. NetWare version of its personal computer conferencing system, a product that previously only supported wide-area Integrated Services Digital Network links.

Fujitsu's DeskTop Conferencing software is a Microsoft Corp.

Windows-based application that enables people to collaborate on projects in real time. The software, designed to add groupware capabilities to any Windows or DOS application (using the Windows DOS prompt), can also be used for remote training and other applications.

The software supports eight users per conference and any number of conferences per network. However, the number of conferences could be limited by the amount of network bandwidth available.

The PC-based Windows application does not require server software, although it can be installed on a server to list conferences (continued on page 6)

HP to unwrap new suite of systems management apps

By Jim Duffy
Senior Editor

FORT COLLINS, Colo. — Hewlett-Packard Co. next week is expected to roll out a suite of applications that will bulk up the systems management capabilities of its OpenView platform.

The new systems management products, 13 in all, are intended to mold OpenView into an integrated and comprehensive systems and network management offering, analysts and developers said. Currently, OpenView provides fairly comprehensive thorough network management through HP and third-party applications but lacks comparable systems management abilities.

"They're making a push into the system management area,"

said James Herman, vice president of Northeast Consulting Resources, Inc. in Boston. "They're trying to bring together network and system management under OpenView to provide users with an integrated set of tools."

Chief among HP's anticipated offerings are the so-called Intelli-

(continued on page 6)

Correction: Due to an editing error, the story "Defense Dept. goes against grain with proprietary net" (NW, April 26, page 1) said the military will release a request for proposal for a messaging network early next year. That RFP actually goes out in a few months.

"Replication is a good technical path for HP," Finkelstein said.


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house, a number of vendors are expected to announce support for the strategy this week. Among them will be Information Build-

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Top guns back new vision

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Executive Officer Michael Fields, the former president of Oracle Corp.'s Oracle USA division. His management team consists of former staffers at Legent Corp., the Massachusetts Institute of Technology, the Open Software Foundation, Inc., Oracle, Silicon Graphics, Inc., Sun Microsystems Inc. and Sybase, Inc.

The company's products, which are all software applications, manage Unix workstations, Digital Equipment Corp. VAX systems and Sequent Computer Systems, Inc. processors on Transmission Control Protocol/Internet Protocol and DECnet networks. Unix and VAX workstations can be configured as OpenVision management consoles, and, in the future, users will be able to launch OpenVision applications from management systems such as HP's OpenView or SunConnect's SunNet Manager, OpenVision officials said.

For operations management, OpenVision rolled out OpenV*High Availability and OpenV*Schedular. The former allows users to maintain availability of crucial applications by automatically restarting the applications, or "failing over" to an alternate platform where similar applications reside. OpenV*Schedular lets users schedule and manage large production jobs across local and wide-area networks.

For performance management, the company unwrapped four applications: OpenV*Event Manager, OpenV*DB Manager, OpenV*Perform and OpenV*Trend.

OpenV*Event Manager allows

users to integrate disparate OpenVision systems management applications into a single-system view of the management operation. OpenV*DB Manager monitors the performance and critical events of relational database management systems from Informix Software, Inc., Oracle and Sybase.

OpenV*Perform triggers alarms when a system's performance approaches user-defined thresholds. And OpenV*Trend



PHOTO © 1992 STEVEN BORNES
Poulin

collects and allows users to view historical performance data.

For storage management, OpenVision unveiled four applications that allow users to archive and retrieve database and operating system files, back up critical data, store files on a number of media and migrate data from local storage to archives.

Also, OpenVision rolled out three applications for security management that enable users to implement Kerberos authentication and authorization procedures, perform audit trails and encrypt data using the Data Encryption Standard.

By the end of the year, OpenVision plans to meld all of its applications into a common interoperable framework based

on HP's OpenView, Fields said. That framework, called OpenV*OPSS, will be event-driven, meaning users set thresholds to trigger alarms instead of polling for critical events.

OpenV*OPSS will support the Simple Network Management Protocol, the Common Management Information Protocol, remote procedure calls and object request brokers as mechanisms for collecting data and initiating management processes, according to OpenVision officials.

Users and analysts said OpenVision's time has come. "The OpenVision approach helps us implement [open systems] in a much quicker fashion," said Dan Poulin, director of information systems at Millipore Corp. in Bedford, Mass.

Norton Greenfeld, director of Unix services at market researcher InfoCorp in Westborough, Mass., expressed similar sentiments. "[Systems management] is probably the major impediment to widespread adoption of open systems, particularly at the large enterprise level," he said. "All the other objections to Unix and open systems, in general, have been met in various ways."

Meanwhile, under the technology exchange partnerships, IBM will resell OpenVision's OpenV*HSM storage management application.

OSF, Tivoli and USL are working with OpenVision to ensure that its applications and OpenV*OPSS architecture support the network and systems management frameworks of those three organizations. □

OpenVision: (510) 426-6424.

HP to unwrap suite of apps

continued from page 4

gent Agent and OperationsCenter application. The Intelligent Agent resides on the networked systems to be managed and sends alert and alarm information on system performance to OperationsCenter, which runs on the OpenView console.

The Intelligent Agent, which currently runs on HP's HP-UX and MPE workstations, IBM's AIX and Sun Microsystems, Inc.'s SunOS systems, can also perform local management, analysts said. Users can predefine remedial actions for Intelligent Agent to kick off for problems that commonly occur in networked systems.

By addressing those problems locally, Intelligent Agent spares the network from excess traffic and frees up the OpenView console for more pressing management concerns.

The Intelligent Agent sup-

ports Simple Network Management Protocol GET, SET and TRAP commands, analysts said, which enables users to issue commands to fix problems as opposed to just monitoring performance.

The OperationsCenter, meanwhile, also allows systems managers to predefine management actions to be taken when particular events occur. Based on those events, OperationsCenter can launch a specific management application or custom scripts to remedy a fault condition.

From an OpenView screen, OperationsCenter allows systems managers to view a map of managed systems with icons representing their operational state. OperationsCenter can be configured to display the entire managed networked or only those nodes and applications a user is responsible for, analysts said.

HP is also expected to unwrap PerfRX, an application that works with HP's existing PerfView performance monitor. PerfRX al-

lows systems administrators to log historical system performance data so trends can be spotted. PerfView only allows managers to monitor system performance in real time.

In addition, analysts and OpenView developers said HP will bundle a number of existing systems management applications, such as HP's NetLS software-licensing server software, under the OpenView umbrella. Other offerings include applications for software distribution, data storage, archiving and backup, file system management and print spooling, sources said.

Intelligent Agent, OperationsCenter, PerfRX and the remainder of the systems management application suite are expected to ship next week. The product suite costs about \$60,000 for 500 users, analysts said. □

Senior Editor Michael Cooney contributed to this story.

Conference pack ties PCs together

continued from page 4

ences centrally or provide security, said Jim Zimmermann, director of marketing for communication systems at Fujitsu.

The software is designed to support conferences supplemented by phone conversations, Zimmermann said. Conferences can be held in an informal format where anyone can take the lead, or in a formal manner where a designated conference chair has control over changes made to shared documents, he said.

Rob White, MIS manager of technical support at Global Marine Corporate Services, Inc., a Houston-based offshore drilling firm, said the DeskTop Conferencing software will save his organization at least two trips to Scotland for training purposes this year.

Global Marine is using the product to train end users on new client/server applications by conferencing them across NetWare local-area networks and 56K bit/sec wide-area network links between Houston and Scotland, among other sites, he said.

"We looked at videoconferencing, but that was too expensive with the need for multiple 56K [bit/sec] lines," White said. "We could do [DeskTop Confer-

encing] with a single 56K [bit/sec] line, and, in testing the product, we found that screen refresh rates were about 10 seconds, which was well within our limits."

The product provides each user with on-screen pointers, and Fujitsu also offers the option of a light pen for indicating changes to shared on-screen applications. Another feature is an electronic flip chart that allows conference users to make notations on a screen and refer to it later.

The software runs in Ethernet or token-ring environments and requires NetWare 2.2, 3.11, 4.0 or Novell's Internetwork Packet Exchange (IPX). For wide-area connectivity, a bridge or router with a minimum bandwidth of 56K bit/sec is recommended. Also required is Microsoft Windows 3.0 or higher, MS-DOS 3.1 or higher and an Intel Corp. 80386 or higher PC.

As for future development, Fujitsu is in discussions with Lotus Development Corp. to integrate Notes into the DeskTop Conferencing system.

DeskTop Conferencing software for Novell nets is available now and costs \$2,475 for a five-user pack. A light pen is available as an option for \$395. □

Fujitsu: (800) 446-4736 or (203) 326-2700.

There's the Cabletron rub

continued from page 1

practical because the amount of coordination needed would greatly delay product delivery times," said one industry observer who requested anonymity. "Because Cabletron is doing this on its own, they can avoid those coordination problems and possibly prove SynOptics and Cisco wrong."

The new MMAC module will provide segmentation and reassembly of ATM cells into local-area network packets, and will route those packets between ATM networks and the traditional LAN technologies currently supported by the MMAC, including Ethernet, token ring, and Fiber Distributed Data Interface. The module, which will support the Simple Network Management Protocol, will be managed via Cabletron's Spectrum net management system.

Network protocols, supported by the router, will include AppleTalk, VINES, DECnet, Novell, Inc.'s Internetwork Packet Exchange (IPX), Open Systems Interconnection, the Transmission Control Protocol/Internet Protocol and Xerox Corp.'s Xerox Network Systems.

The Routing Information Pro-

tol and Open Shortest Path First routing protocols will also be supported, as will several wide-area network interfaces. IBM's Advanced Peer-to-Peer Networking technology is expected to be added in a future release, according to sources.

Details on how the routing capabilities would be integrated into Cabletron's other hubs were not available.

According to the sources, the company will also roll out a new suite of LAN interface modules for the MMAC. The six-port devices will support four 10Base-T Ethernet ports and two user-defined ports, which could be configured as FDDI ports for connection to an FDDI backbone, or ATM interfaces for connection to an ATM backbone switch. The ATM interface will initially support dedicated links of 100M bit/sec.

Similar modules for token-ring environments are expected to be unveiled early this summer, according to the sources.

"Our announcement will involve integrated routing functionality that will be implemented throughout our entire hub line," said a Cabletron spokesman. He declined to provide any further details. □

Cabletron: (603) 332-9400.

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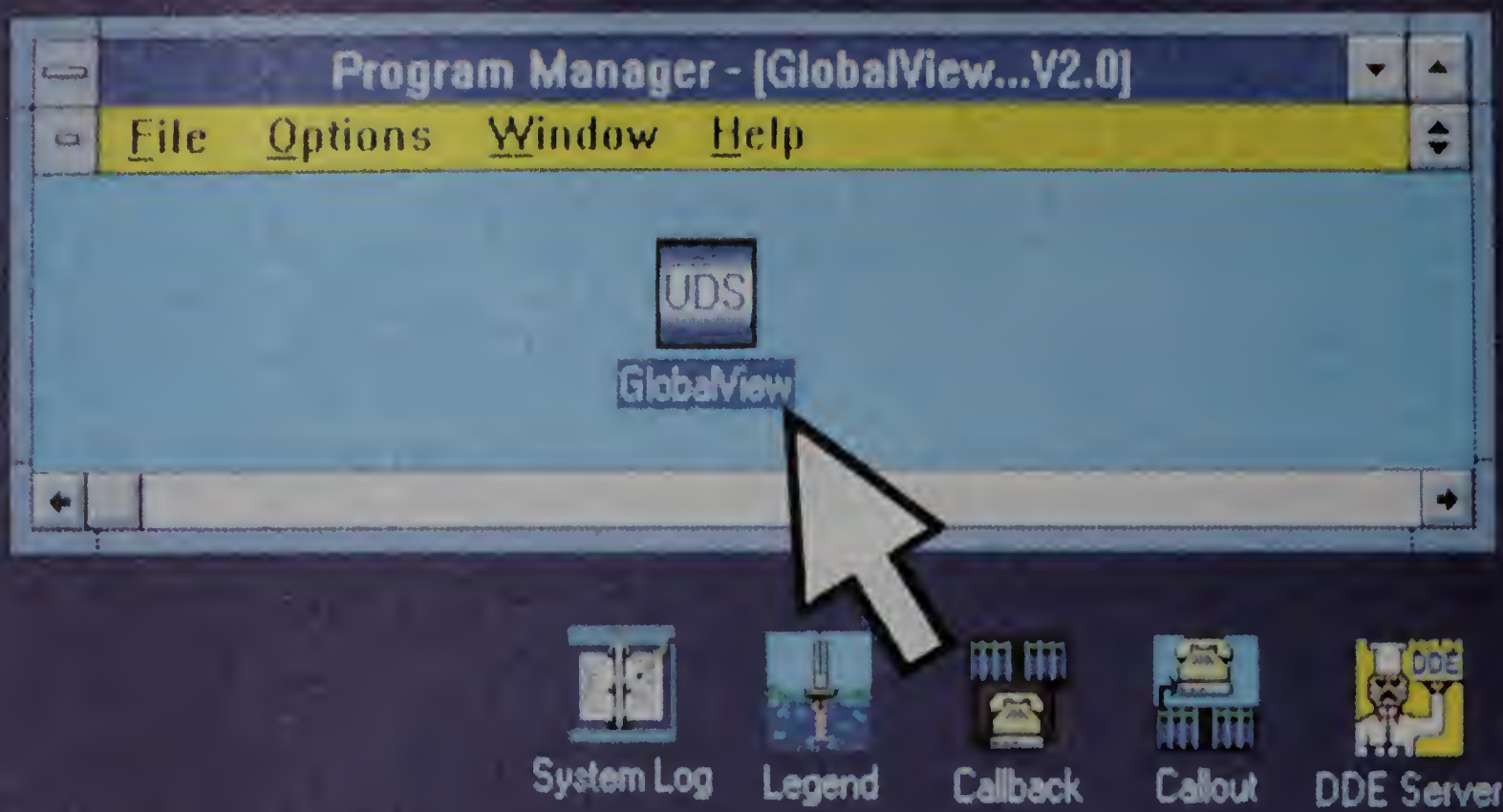
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NETWORK ARCHITECTURES, DATA NETWORK EQUIPMENT, STANDARDS AND ENTERPRISE NETWORK MANAGEMENT

Worth Noting

For performance and management assessments, we need a different animal. It's got to be vendor-specific. We need a specialist for that. There isn't this panacea."

John Boyd
Supervisor
Communications Systems
Northeast Utilities
Hartford, Conn.
Referring to the need for device-specific management systems vs. umbrella management systems.

Ascend gives inverse muxes more management weight

Also adds configuration options to Multiband line.

By Bob Wallace
Senior Editor

ALAMEDA, Calif. — Ascend Communications, Inc. last week announced a software and hardware package that adds new management capabilities and configuration options for its Multiband family of inverse multiplexers.

The new package enables users to manage the devices from a Simple Network Management Protocol-based terminal, collect critical call detail data and switch among carrier services for least cost routing purposes or in disaster situations.

The package is available for Ascend's two- or four-port Multiband LAN Service Unit, its four-port Multiband Plus local-area network and video service unit, and its 32-port Multiband MAX network hub. It will be available by midyear.

"The pioneer switched digital users have come back to us with

arrows in their backs and told us that they had to have these features," said Jay Duncanson, an Ascend founder. "These are really just meat and potatoes features."

The vendor has built what it calls the Ascend Enterprise Management Information Base that resides on an SNMP-based management system such as Sun Microsystems, Inc.'s SunNet Manager or Hewlett-Packard Co.'s OpenView.

From the SNMP management station, users can employ Telnet, the Transmission Control Protocol/Internet Protocol virtual terminal protocol, to make configuration changes, conduct diagnostics and perform other management tasks.

"SNMP support was the most requested feature," Duncanson said. "Our users said they wanted to manage their bridges, routers
(continued on page 10)

DEC expands, upgrades terminal server wares

By Jim Duffy
Senior Editor

MAYNARD, Mass. — Digital Equipment Corp. last week expanded and upgraded its terminal server product line with support for more protocols and additions at the low and high ends.

The new DECserver products are designed to broaden users' connectivity options for linking asynchronous devices, such as video terminals, serial printers, modems, data switches and personal computers, to other devices on Ethernet local-area networks.

DEC's new DECserver Network Access Software Version 1.0, like previous versions of DECserver software, supports DEC's Local Area Transport and Transmission Control Protocol/Internet Protocol Telnet protocols for terminal-to-host sessions, and the Serial Line Internet Protocol (SLIP) for running IP traffic over serial lines.

But Network Access Software expands on that by providing Compressed Serial Line Interface Protocol (CSLIP) and Point-to-

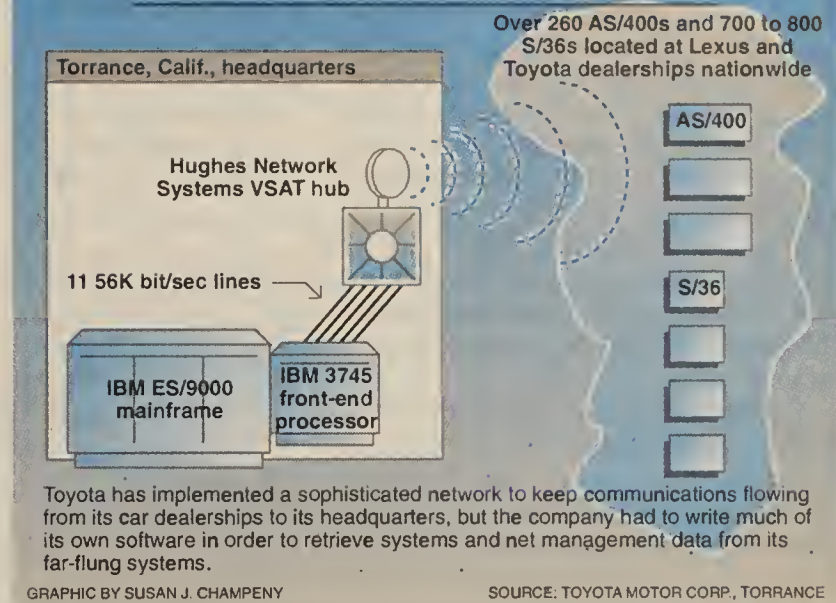
Point Protocol (PPP) support. CSLIP differs from SLIP in that its headers are shorter, which is intended to make data transmission more efficient over dial-up lines. PPP allows the terminal server to provide host-to-network connections over synchronous and asynchronous circuits.

Network Access Software also supports TN3270, which enables users on a TCP/IP network to access IBM mainframe applications using the Telnet virtual terminal protocol, and Kerberos security for password and user authentication.

Meanwhile, DEC added terminal servers at the low and high end that support the new software. At the low end, DEC brought out the DECserver 90M, an eight-port terminal server module for DEC's DEChub 90 Ethernet hub.

DECserver 90M supports asynchronous port speeds of 57.6K bit/sec. It includes a flash memory feature that allows users to store software in random-access
(continued on page 10)

Homegrown AS/400 management



Toyota drives its own net mgmt. apps

Carmaker develops in-house apps to manage AS/400s, helps shape future mgmt. platform.

By Michael Cooney
Senior Editor

TORRANCE, Calif. — The best solutions to many net problems sometimes come from the people who deal with them everyday.

Users at Toyota Motor Corp. feel that way, having developed in-house many of the applications used to manage the company's Systems Network Architecture net that includes more than 260 Application System/400 minicomputers. But they do look forward to some help from future IBM and Candle Corp. management products.

"We need better ways to get systems and network management information back to the central site without having to go through a lot of trouble getting it there," said John Bye, teleprocessing systems manager for Toyota.

The company has AS/400s in auto dealerships across the country linked to an IBM mainframe via a Hughes Network Systems satellite hub. The network handles a variety of applications, from car parts tracking and accounting to insurance and vehicle locators. It is managed using IBM's host-based NetView net management platform.

The large number of AS/400s in use, coupled with the fact that IBM has yet to come out with much in the way of AS/400 systems and net management software, led Toyota to develop some

of its own applications to monitor AS/400 activity, such as remote file transfers and communication among dealerships.

"We wrote our own monitoring software that uses [Network Management Vector Transports] to send data back to NetView," Bye said.

Toyota wants to keep centralized control over its systems due to a lack of technical expertise at the sites where the AS/400s are deployed. It would also like to receive more information about the activity at its AS/400 locations.

"It would be nice, for example, to know from the central location when the [direct-access storage device] was running low on our AS/400s," Bye said. "We'd also like to see improved automated responses to network problems to cut back on help desk calls."

While user requirements often fall on deaf ears, Toyota's requirements could help shape the AS/400 systems and network management platforms of the future. That's because Bye is part of IBM's Advisory Council/400, which is overseeing the technical development of Candle's and IBM's AS/400 network and systems management products.

Automation Center/400, the first fruit of the IBM-Candle development, is expected in December. It consists of three components — Omegamon/400, Ome-
(continued on page 11)

Data Packets

Northern Telecom, Inc. in Raleigh, N.C., recently announced a new single-slot card that replaces the two-slot card currently in use in its DMS-100 switches.

The new card supports Switched 56 and Integrated Services Digital Network on one card, freeing up space on the DMS-100 for additional cards and lines. The new card uses less power and is easier to install and configure, the company said.

The new single-slot card will be available in July. Pricing was not announced.

Northern Telecom: (919) 992-4197.

Rabbit Software Corp. of Malvern, Pa., has announced a new version of its Windows-based 3270 emulation software. Open Advantage for Windows 3270 Version 2.0 adds support for Dynamic Data Exchange.

The new software is available for \$425 for Distributed Function Terminals and \$395 for local-area network workstations.

Rabbit Software: (215) 647-0440. ☐

Ascend gives inverse muxes more weight

continued from page 9

and their Ascend boxes from a single SNMP management terminal."

Today, Ascend users have to plug a Digital Equipment Corp. VT-100 or compatible terminal or an Ascend palmtop terminal into a central Multiband device in order to manage other Ascend inverse muxes.

Reginald Best, vice president of marketing for Teleos Communications, Inc., an Ascend rival, said his company would provide SNMP support in nine to 12 months. He stressed that Teleos already has offered call detail data, T-1-to-Primary Rate Interface (PRI) conversion and a multicarrier gateway as standard features for some time.

Ascend's Call Detail Recording feature provides a database of information — including the date and time, the called number, the calling number, whether the call was incoming or outgoing, the carrier service used, and the session and port — for all calls.

The information can be used to create

DEC expands terminal servers

continued from page 9

cess memory instead of booting and loading the server from a host computer.

It also supports the Terminal Device/Session Management Protocol (TD/SMP), which allows users to run multiple sessions concurrently on a TD/SMP-compliant terminal, such as DEC's VT420. For example, DECserver 90M users can simultaneously access 64 different host sessions operating under a mix of protocols without having to log in and out of each session, DEC said.

The DECserver 90M is manageable from any Simple Network Management Protocol console as well as from DEC's Terminal Server Manager product and other remote terminal server managers.

At the high end, DEC unveiled a new version of the DECserver 700 that features the flash memory option and support for the new Network Access Software package. The new server also allows users to expand memory from 4M bytes to 8M bytes, as needed.

The DECserver 700 is available in eight- and 16-port configurations with line speeds of 115.2K bit/sec.

For management, DEC unwrapped Version 2.0 of its Terminal Server Manager (TSM) software. TSM runs on a DEC VAX computer and allows users to centrally configure, monitor and control DEC terminal servers.

Version 2.0 of TSM can now manage terminal servers that run the new Network Access Software program, such as the DECserver 90M and the new DECserver 700.

Network Access Software costs \$700, and DECserver 90M is priced from \$1,755 to \$2,200. DECserver 700 with the flash memory feature costs \$3,095 for the eight-port version and \$3,494 for the 16-port configuration. The flash memory option is an additional \$795. TSM Version 2.0 costs \$3,560.

All products are available now. **■**

DEC: (800) 344-4825.

reports on costs for individual calls and inverse mux sessions, as well as the cost per application and bandwidth usage patterns.

The Ascend products will also be able to support a feature called T1-to-PRI Conversion. With this enhancement, users can reap the benefits of mixing dedicated and switched services on an Integrated Services Digital Network Primary Rate Interface without footing the bill for a private branch exchange PRI interface.

This means that users can send voice and data traffic from a PBX over a T-1 to an Ascend product equipped with a PRI, which

also accepts feeds from LANs.

Firms that want to use this feature will have to equip their Ascend boxes with a device called a tone decoder, which takes tone signals from a PBX and converts them into ISDN signaling information, which is then sent over the PRI's 64K bit/sec D signaling channel.

Ascend also announced the multicarrier gateway, which enables its devices to dial up bandwidth from a second carrier if the first suffers an outage, or use the carrier whose rates are the lowest at that time. The selection may be made by a specified

dial plan, list or prioritized alternate paths.

Duncanson said the Multiband products work with switched services from the Big Three carriers.

All of the products will be available by May 30. The new software release costs \$500. SNMP supports cost an extra \$1,000, as does the T1-to-PRI feature. In addition, Ascend will begin shipping a redundant power module for its MAX on June 30. **■**

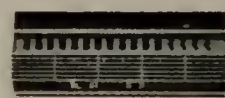
Ascend: (510) 769-6001.

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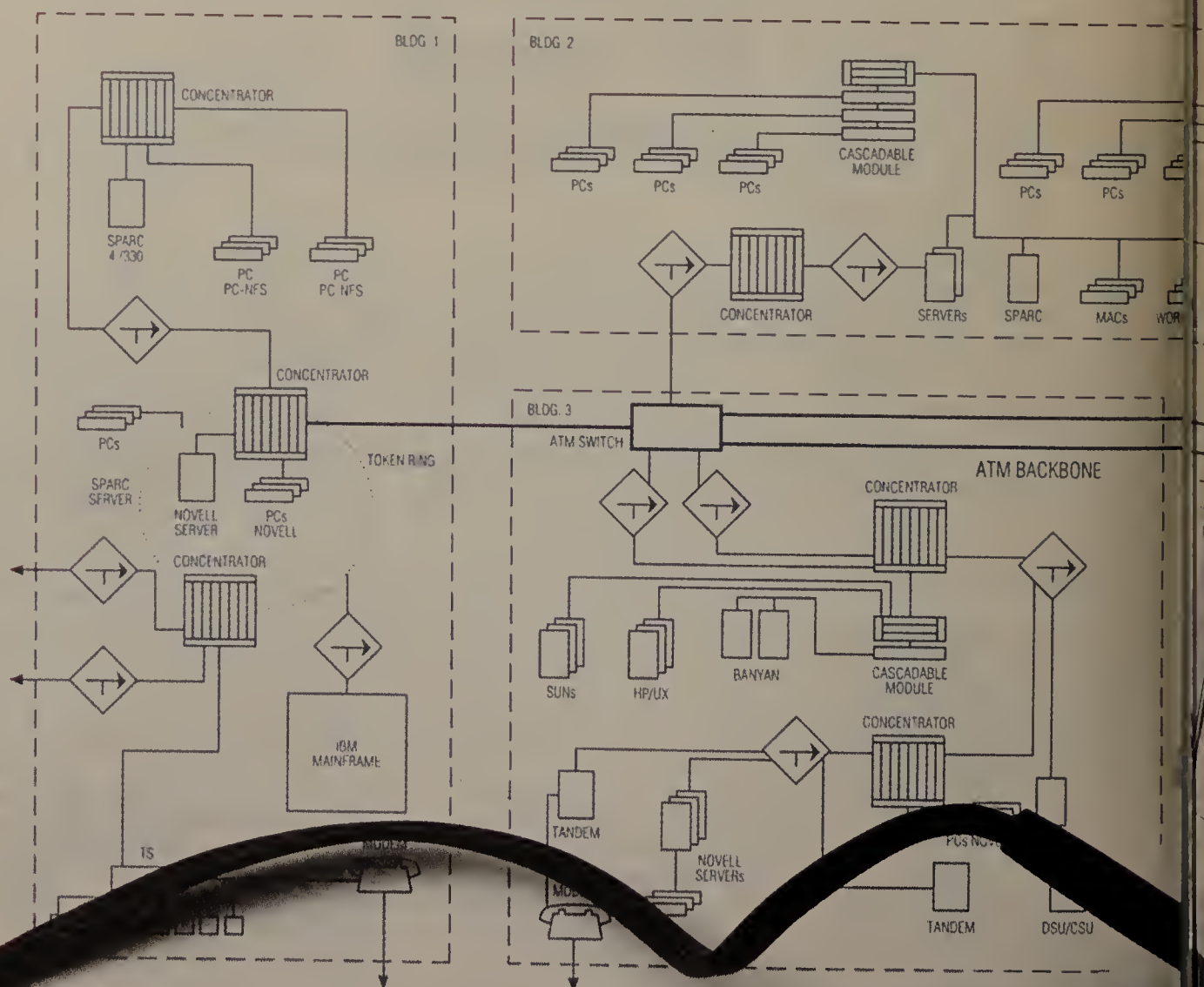
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ProTools pack gives NetView a handle on LAN performance data

By Michael Cooney
Senior Editor

BEAVERTON, Ore. — NetView users can now get a better handle on the performance of their remote LANs with a new release of Network Control Series (NCS) network performance analysis software from ProTools, Inc.

NCS Version 1.3 software adds the ability to send alerts to the host-based NetView via IBM's LAN Network Manager. The new software also adds an improved graphical user interface (GUI) and a new out-of-band option for sending net management data.

The enhancements will give NetView users

more information about the local-area networks they monitor, while giving local users an improved graphical representation of their LAN environment and new configuration options.

NCS consists of two parts — Foundation Manager and Cornerstone Agent — that reside on OS/2-based personal computers.

Foundation Manager monitors and analyzes LAN traffic from as many as 256 token-ring or Ethernet LANs. Cornerstone Agent runs on PCs attached to remote LANs and can pass LAN performance data

to Foundation Manager. It can also act as a local performance analyzer for a single LAN.

With NCS Version 1.3, alerts can now be generated from Foundation Manager, forwarded to a local IBM LAN Network Manager and then sent to NetView using IBM's Network Management Vector Transport format.

The new feature will let NetView users monitor LAN network utilization, frames received, total errors and other LAN performance statistics. Foundation Manager alerts sent to NetView also recommend a course of action for the NetView operator to take.

"Since LAN Network Manager only supports token ring and NCS supports token ring and Ethernet, we are giving LAN information to IBM NetView users that was previously unavailable to them from anyone," said Ellen Recko, product manager for ProTools.

Locally, ProTools users can more efficiently gather data on LAN performance via a new Solution Bar GUI. The new interface lets users create icons representing the performance of individual token-ring or Ethernet LANs that they can click on for quick reference.

Another new feature, Network Out of Band, lets NCS users route their LAN performance data onto a separate parallel network from one copy of NCS. By pulling the management data out of typical data flow, users can increase overall net throughput and diagnose problems on the primary net even if the network goes down.

NCS Version 1.3 is available now, and the new features are free to current ProTools NCS users. For new users, Foundation Manager costs \$10,795 and Cornerstone Agent costs \$1,500. ■

ProTools: (503) 645-5400.

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So if you're building or managing an enterprise network, get the wrinkles out with our integrated solutions. Call 1-800-PRO-NTWK for our Solutions Kit on ATM, including our just-released white paper "The Roadmap to ATM Networking." Because at SynOptics, we're smoothing the way for the network of the future.

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The Network Fabric of Computing

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Toyota drives its own net mgmt. apps

continued from page 9
gaView/400 and Automated Facilities/400 — that will help users manage a single AS/400 or a network of AS/400s from a single hub machine. The platform will have a graphical monitor and will keep track of net performance, response times and excessive CPU usage, among other things.

Bye has evaluated the IBM-Candle platform and said it could fill many of the systems management gaps that exist today. But he has not yet committed to buying it; he would like to see it in action first.

Improved management is not the firm's only interest, however. Bye would also like to see enhancements to centralized software distribution products. "Even with the proper tools to do remote distribution, we still need somebody out there to see that it is received and set up properly," he said.

NetView Distribution Manager (NVDM), which the company uses to disperse some software throughout its SNA net, is an example of what needs to be improved, according to Bye. "Defining everything required to make NVDM work is not a trivial undertaking," he said. "We have to take the network down every time we define or redefine a resource." ■

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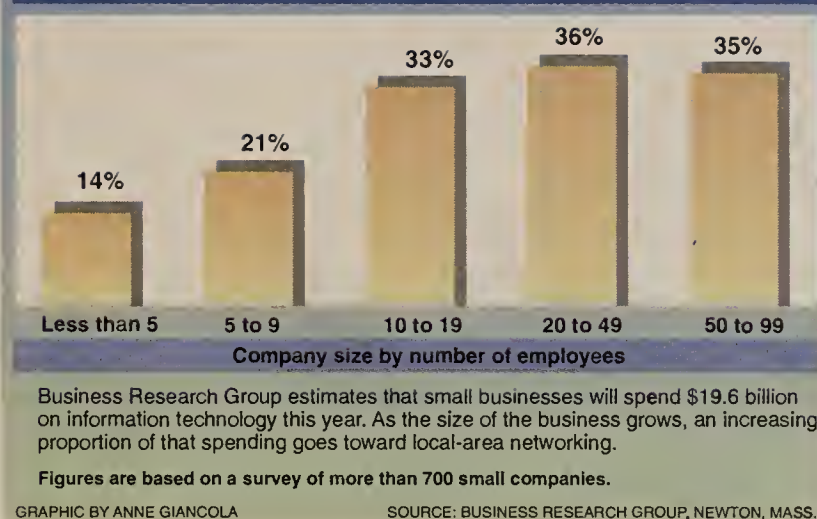
LOCAL NETWORKING

LAN HARDWARE, NETWORK OPERATING SYSTEMS AND LAN MANAGEMENT

Worth Noting

Seventy percent of users surveyed cited as their first or second most critical need or problem the cost of upgrading all work group LANs to the latest network operating system revision, according to a recent study by Business Research Group in Newton, Mass.

LANs big with small businesses



Farallon brings SNMP to AppleTalk with releases

Offerings are designed to fill gaps in firm's line.

By Fredric Paul
Senior Editor

ALAMEDA, Calif. — Farallon Computing, Inc. last week introduced a variety of new Ethernet products for Macintosh networks, including the industry's first hubs that can be managed using the Simple Network Management Protocol over AppleTalk networks.

According to Steve Holtzman, Farallon's vice president of marketing, the new hubs, concentrators, transceivers and management tools consist of replacements and upgrades designed to fill the gaps in the company's line and work with the latest offerings from Apple Computer, Inc.

The new 12-port Ether 10-T StarController/557 10Base-T repeater uses enhanced StarCommand 3.2 network management software to support both proprietary out-of-band management and in-band management using SNMP over Transmission Control Protocol/Internet Protocol or AppleTalk nets. "It's the only hub in the Apple space that does SNMP," Holtzman said.

The StarController/557 also displays Macintosh chooser device and system names to let network managers see which users are connected to which port. Accessible via SNMP, this feature was previously available only on LocalTalk nets, he said.

"Management is the key value here," Holtzman said. With SNMP support, network administrators can see into and manage Ethernet-based AppleTalk nets from any SNMP management station.

The new StarController/557 uses National RIC repeater and Sonic controller chips. It boasts a Motorola, Inc. 68032 processor, 512K of random-access memory and flash erasable programmable read-only memory to allow remote software upgrades.

The low-end Ether 10-T StarController is physically identical to its more expensive cousin, but it uses Farallon's existing StarCommand 3.1.1 out-of-band network management system and does not support in-band network management. Upgrading to the 557 product is a software-only process, the company said.

The Ether 10-T StarControllers are available in their own plastic case or ready to be mounted into a Farallon Concentrator 11-slot hub. Installed in the concentrator, StarController connects to a pair of Ethernets. As a stand-alone unit, an optional 13th port lets the concentrator connect to network backbones via BNC, 10Base-T or attachment unit interface links.

The Ether 10-T StarController/557 is scheduled to ship in June for \$1,599; \$1,799 with the 13th port. The Ether 10-T StarController is available for \$1,399; \$1,599 with the 13th port.

Along with SNMP support, Farallon's new NetAtlas 2.0 software improves network mapping with zone-by-zone coverage and integration with StarCommand and Farallon's Timbuktu line of file exchange and remote control software. NetAtlas 2.0 is available. (continued on page 19)

Novell ignites mart with new software

Latest version of NetWare 3270 for Windows product includes number of 'hot' capabilities.

By Caryn Gillooly
Senior Editor

SUNNYVALE, Calif. — Novell, Inc. came out with one of its "hot-test" products ever last week with the release of the next version of its NetWare 3270 LAN Workstation for Windows client software.

The new release includes such features as Hot Standby, Hot Link and Hot Spots, all designed to disguise the complexities of connecting a Windows-based workstation on a NetWare local-area network to an IBM mainframe.

"The new release of NetWare 3270 LAN Workstation for Windows helps our enterprise computing customers continue to tie their mainframe and [LAN] resources together," said Gerry Machi, vice president and general manager at Novell here. "To accomplish this, we have better integrated desktop applications with the mainframe."

NetWare 3270 LAN Worksta-

tion for Windows is client-based terminal-emulation software. It is used in conjunction with NetWare for SAA, Novell's Systems Network Architecture gateway software residing on the NetWare server. Together, they provide IBM host connectivity for Microsoft Corp. Windows 3.0 and 3.1 users on a NetWare LAN.

One of the primary enhancements, Hot Standby, adds a higher level of fault tolerance between the workstation and the mainframe. If the connection between the Windows workstation and the mainframe is lost, the client software will automatically reestablish a new session with the same mainframe or with an alternate mainframe if the problem was on the first machine.

Before this release, if the session was lost, the user had to manually reestablish the session. According to Bernard Harguinde- (continued on page 19)

Netnotes

Digital Communications Associates, Inc., based in Alpharetta, Ga., last week expanded and enhanced its existing line of token-ring products, added a new line of 100%-IBM-compatible token-ring cards and introduced its first token-ring net management product.

The new IRMAtrac Network Sensor is a multiprotocol monitoring tool for medium to large local-area nets. It is set to ship in May for \$2,995.

DCA added to its line of IRMAtrac products with adapters for Extended Industry Standard Architecture (EISA) bus personal computers. Shipping this summer, the 512K random-access memory IRMAtrac EISA costs \$995.

The ClassicBlue line of token ring network adapter cards is designed for users more concerned with compatibility than sheer performance, said Daniel Aghion, DCA's director of marketing. The \$675 ClassicBlue ISA bus adapter is shipping now.

The company also announced Version 3.0 of its Ring Advanced Communications Executive software platform for IRMAtrac, and new drivers to support desktop and net operating systems. □

Sequent unveils details of new Windows NT Servers

By Fredric Paul
Senior Editor

BEAVERTON, Ore. — Sequent Computer Systems, Inc. this week plans to unveil its family of WinServer products for Microsoft Corp.'s Windows NT Advanced Server operating system.

Developed in conjunction with Microsoft, the WinServer line, which was expected (NW, Jan. 25, page 4), is intended to primarily service database and other applications, leaving file and print services to less powerful machines. All of the WinServers will come preloaded with Windows NT Advanced Server and may also be bundled with Microsoft's SQL Server or Oracle Corp.'s Oracle 7 databases.

The WinServer line consists of four symmetrical multiprocessing units with one to 16 Intel Corp. 486 processors each. All of the machines will be able to use Intel's new Pentium chips when they become available.

Targeted at work groups and small departments using client/server applications, the low-end WinServer 1000 is a specially tuned OEM version of Tricord Systems, Inc.'s current M30 and M40 servers designed for Novell, Inc. NetWare networks.

The 1000 supports one or two 66-MHz processors, up to nine disks, 128M bytes of random-access memory (512K RAM will be available with 16M bytes of dynamic RAM later this year), a pair of fast Small Computer System Interface (SCSI)-2 channels, and Redundant Array of Inexpensive Disks (RAID) Levels 0 and 1 implemented in the hardware.

According to Paul Gifford, director and general manager of Sequent's Windows NT business operation, embedding RAID support in the hardware I/O is much faster than having RAID support built into the Windows NT software.

(continued on page 19)

Announcing the first network printer



<i>Operating System</i>	<i>Topology</i>
<i>Novell Netware</i>	<i>*Ethernet/802.3</i> <i>Token Ring (4/16 Mbps)</i>
<i>Microsoft®</i>	<i>*802.3</i>
<i>LAN Manager</i>	<i>Token Ring (4/16Mbps)</i>
<i>Windows for</i>	<i>*802.3</i>
<i>Workgroups</i>	<i>Token Ring (4/16 Mbps)</i>
<i>Windows NT</i>	<i>*802.3</i> <i>Token Ring (4/16 Mbps)</i>
<i>IBM LAN Server</i>	<i>*802.3</i> <i>Token Ring (4/16 Mbps)</i>
<i>AppleTalk</i>	<i>*LocalTalk</i> <i>*EtherTalk</i>
<i>HP-UX**</i>	<i>*Ethernet</i>
<i>SunOS**</i>	<i>*Ethernet</i>
<i>Solaris**</i>	<i>*Ethernet</i>
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*Standard in the HP LaserJet 4Si MX printer. **For operating HP-UX, SunOS or Solaris, a one-time purchase of \$199 in configuration software is required. Adobe and PostScript are trademarks of Adobe Systems Inc. which may be registered in certain jurisdictions. Microsoft is a U.S. registered trademark of Microsoft Corporation. UNIX is a registered trademark of UNIX System Laboratories Inc. in the U.S.A. and other countries. †In Canada call 1-800-387-3867, Ext. 7299. © 1993 Hewlett-Packard PE12353

Multiple environments are no longer worlds apart. Even if you have Novell Netware on one network, HP-UX on another and EtherTalk on a third, the new HP LaserJet 4Si MX printer easily connects across platforms. Automatically.

The HP LaserJet 4Si MX printer comes out-of-the-box preconfigured for multiple environments. There's nothing more to do than plug-and-play. All interfaces are simultaneously hot, making switching so seamless, end-users won't even notice.

What's more, HP's LaserJet 4Si MX printer is ready to handle whatever needs come down the

that adapts to multiple environments.



pike. More operating systems? No problem. As your network system continues to evolve, the capabilities of this printer are no longer just impressive. They're indispensable.

The HP LaserJet 4Si MX printer is loaded with features that define state-of-the-art. HP's enhanced PCL5 and genuine PostScript™ Level 2 software from Adobe™ come standard. Printer environments are saved while switching. Setup is a cinch with network software utilities and drivers included in the box. And, if you need any reassurance about trouble-free operation, you have it in our Simple Network Management Protocol (SNMP) support.

At 17 ppm, this is the fastest LaserJet ever, with I/Os and RISC-based formatter capabilities matched to support its speed. It delivers impeccable 600 dpi print quality—thanks to HP's microfine toner and Resolution Enhancement technology. Plus, it comes standard with two 500 sheet input trays.

But what if you don't need the full capabilities of the HP LaserJet 4Si MX printer right away? HP offers another printer that's probably a perfect fit. The HP LaserJet 4Si printer delivers the identical 17 ppm performance and superb 600 dpi print quality. It also has room to grow. The two MIO expansion slots let you add

HP JetDirect network interface or third party cards. And you can add on Adobe's genuine PostScript Level 2 software and SIMM memory modules, as you need them.

To find out more about the multiple-network HP LaserJet 4Si MX printer and the upgradable HP LaserJet 4Si printer just call 1-800-LASERJET, Ext. 7299.† Capabilities this advanced make a world of difference—in any environment.

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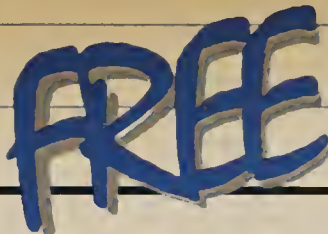
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Is this your Business Address? Yes ☐ No ☐
Please Answer **ALL** Questions, Sign and Date the Form.

1 Industry: (check one only)

- 01. ☐ Manufacturers (other than Computer/Communications)
- 02. ☐ Finance/Banking
- 03. ☐ Insurance
- 04. ☐ Real Estate
- 05. ☐ Healthcare Services
- 06. ☐ Legal
- 07. ☐ Hospitality
- 08. ☐ Retail/Wholesale Trade/Business Services
- 09. ☐ Transportation
- 10. ☐ Utilities
- 11. ☐ Education
- 12. ☐ Process Industries (Mining/Construction/
Petroleum Refining/Agriculture/Forestry)
- 13. ☐ Government, State/Local
- 14. ☐ Government, Federal
- 15. ☐ Military
- 16. ☐ Aerospace
- 17. ☐ Consultants (Independent)
- 18. ☐ Carriers
- 19. ☐ Interconnects
- 20. ☐ Manufacturers (Computer/Communications)
- 21. ☐ VAR/VAD/VAN/ Systems Houses
- 22. ☐ Distributors, Computer Related
- 23. ☐ Distributors, Communications Related
- 24. ☐ Other

2 What is your job function? (check one only)

NETWORKING MANAGEMENT

- 1. ☐ Networking Mgmt.
- 3. ☐ Datacom/Telecom Mgmt.
- 2. ☐ LAN Mgmt.
- 4. ☐ Engineering Mgmt.

MIS MANAGEMENT

- 5. ☐ MIS, IS, IT Mgmt.
- 6. ☐ Engineering Mgmt.

CORPORATE MANAGEMENT

- 7. ☐ Corporate Mgmt. (CIO, CEO, Pres., VP, Dir., Mgr., Financial Mgmt.)
- 8. ☐ Consultant (Independent)
- 9. ☐ Other

3 My responsibilities include: (check one only)

- 1. ☐ LANs/ Internetworking/ WANs
- 3. ☐ LANs
- 5. ☐ None
- 2. ☐ LANs/ Internetworking
- 4. ☐ WANs
- 6. ☐ 1

4 What is the total number of sites for which you have purchase influence? (check one only)

- 1. ☐ 100+
- 3. ☐ 20 - 49
- 5. ☐ 2 - 9
- 7. ☐ None
- 2. ☐ 50 - 99
- 4. ☐ 10 - 19
- 6. ☐ 1

5 What is your scope and involvement in purchasing decisions for network products & services for your enterprise?

- | | |
|---|---|
| A. Scope
(check one only) | B. Involvement
(check all that apply) |
| 1. <input type="checkbox"/> Corporatewide | 1. <input type="checkbox"/> Recommend/Specify |
| 2. <input type="checkbox"/> Multienterprise (consultants) | 2. <input type="checkbox"/> Approve |
| 3. <input type="checkbox"/> Departmental | 3. <input type="checkbox"/> Evaluate |
| | 4. <input type="checkbox"/> None (A or B) |

6 Check all that apply in Columns A and B:

- A: I am involved in the purchase of the following products/services.
- B: I plan to purchase the following products/services in the next year.

- | | |
|--|--|
| Involved | Plan to Purchase |
| A | B |
| <input type="checkbox"/> 01. Local-Area Networks | <input type="checkbox"/> 01. Local-Area Networks |
| <input type="checkbox"/> 02. LAN Servers | <input type="checkbox"/> 02. LAN Servers |
| <input type="checkbox"/> 03. LAN Operating Systems Software | <input type="checkbox"/> 03. LAN Operating Systems Software |
| <input type="checkbox"/> 04. Superservers | <input type="checkbox"/> 04. Superservers |
| <input type="checkbox"/> 05. Data Base Servers (Oracle, Sybase, etc.) | <input type="checkbox"/> 05. Data Base Servers (Oracle, Sybase, etc.) |
| <input type="checkbox"/> 06. Terminal Servers | <input type="checkbox"/> 06. Terminal Servers |
| <input type="checkbox"/> 07. LAN Services | <input type="checkbox"/> 07. LAN Services |
| <input type="checkbox"/> 08. LAN Storage Devices (optical, tape, disk, etc., including backup systems) | <input type="checkbox"/> 08. LAN Storage Devices (optical, tape, disk, etc., including backup systems) |
| <input type="checkbox"/> 09. Network Test Equipment | <input type="checkbox"/> 09. Network Test Equipment |
| <input type="checkbox"/> 10. Hubs | <input type="checkbox"/> 10. Hubs |
| <input type="checkbox"/> 11. Cables, Connectors, Baluns | <input type="checkbox"/> 11. Cables, Connectors, Baluns |
| <input type="checkbox"/> 12. UPS | <input type="checkbox"/> 12. UPS |
| <input type="checkbox"/> 13. Network Adapter Boards | <input type="checkbox"/> 13. Network Adapter Boards |
| <input type="checkbox"/> 14. Peer-to-Peer LANs | <input type="checkbox"/> 14. Peer-to-Peer LANs |
| <input type="checkbox"/> 15. Wireless LANs | <input type="checkbox"/> 15. Wireless LANs |
| <input type="checkbox"/> 16. SNMP Network Management | <input type="checkbox"/> 16. SNMP Network Management |
| <input type="checkbox"/> 17. ATM (Asynchronous Transfer Mode) | <input type="checkbox"/> 17. ATM (Asynchronous Transfer Mode) |

- | | |
|---|---|
| A | B |
| <input type="checkbox"/> 18. Bridges | <input type="checkbox"/> 18. Bridges |
| <input type="checkbox"/> 19. Routers | <input type="checkbox"/> 19. Routers |
| <input type="checkbox"/> 20. Gateways | <input type="checkbox"/> 20. Gateways |
| <input type="checkbox"/> 21. Bridge/Routers | <input type="checkbox"/> 21. Bridge/Routers |
| <input type="checkbox"/> 22. Hubs | <input type="checkbox"/> 22. Hubs |
| <input type="checkbox"/> 23. Intelligent Hubs | <input type="checkbox"/> 23. Intelligent Hubs |
| <input type="checkbox"/> 24. Communications Servers | <input type="checkbox"/> 24. Communications Servers |

- | | |
|---|---|
| Involved | Plan to Purchase |
| A | B |
| <input type="checkbox"/> 25. Micros/PCs | <input type="checkbox"/> 25. Micros/PCs |
| <input type="checkbox"/> 26. Minis | <input type="checkbox"/> 26. Minis |
| <input type="checkbox"/> 27. Mainframes | <input type="checkbox"/> 27. Mainframes |
| <input type="checkbox"/> 28. Pen-Based | <input type="checkbox"/> 28. Pen-Based |
| <input type="checkbox"/> 29. Laptops | <input type="checkbox"/> 29. Laptops |
| <input type="checkbox"/> 30. Workstations | <input type="checkbox"/> 30. Workstations |
| <input type="checkbox"/> 31. Image Processing Workstations | <input type="checkbox"/> 31. Image Processing Workstations |
| <input type="checkbox"/> 32. Front-End Processors | <input type="checkbox"/> 32. Front-End Processors |
| <input type="checkbox"/> 33. Terminals | <input type="checkbox"/> 33. Terminals |
| <input type="checkbox"/> 34. Printers | <input type="checkbox"/> 34. Printers |
| <input type="checkbox"/> 35. Cluster Controllers | <input type="checkbox"/> 35. Cluster Controllers |
| <input type="checkbox"/> 36. Fax Machines | <input type="checkbox"/> 36. Fax Machines |
| <input type="checkbox"/> 37. X-Terminals | <input type="checkbox"/> 37. X-Terminals |
| A | B |
| <input type="checkbox"/> 38. Network Management | <input type="checkbox"/> 38. Network Management |
| <input type="checkbox"/> 39. Micro to Mainframe | <input type="checkbox"/> 39. Micro to Mainframe |
| <input type="checkbox"/> 40. Security | <input type="checkbox"/> 40. Security |
| <input type="checkbox"/> 41. Communication/Terminal Emulation | <input type="checkbox"/> 41. Communication/Terminal Emulation |
| <input type="checkbox"/> 42. Word Processing | <input type="checkbox"/> 42. Word Processing |
| <input type="checkbox"/> 43. Operating Systems | <input type="checkbox"/> 43. Operating Systems |
| <input type="checkbox"/> 44. Business Applications (Finance/Mfg/HR) | <input type="checkbox"/> 44. Business Applications (Finance/Mfg/HR) |
| <input type="checkbox"/> 45. Applications Development | <input type="checkbox"/> 45. Applications Development |
| <input type="checkbox"/> 46. Data Base Management | <input type="checkbox"/> 46. Data Base Management |
| <input type="checkbox"/> 47. Spreadsheet | <input type="checkbox"/> 47. Spreadsheet |
| <input type="checkbox"/> 48. Groupware | <input type="checkbox"/> 48. Groupware |
| <input type="checkbox"/> 49. EDI | <input type="checkbox"/> 49. EDI |
| <input type="checkbox"/> 50. E-Mail | <input type="checkbox"/> 50. E-Mail |
| <input type="checkbox"/> 51. Windows/Graphical User Interface | <input type="checkbox"/> 51. Windows/Graphical User Interface |
| <input type="checkbox"/> 52. 4GL/Development | <input type="checkbox"/> 52. 4GL/Development |
| <input type="checkbox"/> 53. Multimedia | <input type="checkbox"/> 53. Multimedia |
| <input type="checkbox"/> 54. Graphics | <input type="checkbox"/> 54. Graphics |
| <input type="checkbox"/> 55. Utilities | <input type="checkbox"/> 55. Utilities |
| A | B |
| <input type="checkbox"/> 56. Modems (9.6K bps and over) | <input type="checkbox"/> 56. Modems (9.6K bps and over) |
| <input type="checkbox"/> 57. Modems (under 9.6K bps) | <input type="checkbox"/> 57. Modems (under 9.6K bps) |
| <input type="checkbox"/> 58. T-1 | <input type="checkbox"/> 58. T-1 |
| <input type="checkbox"/> 59. T-3 | <input type="checkbox"/> 59. T-3 |
| <input type="checkbox"/> 60. Fractional T-1 | <input type="checkbox"/> 60. Fractional T-1 |
| <input type="checkbox"/> 61. Data Switches | <input type="checkbox"/> 61. Data Switches |
| <input type="checkbox"/> 62. SMDS | <input type="checkbox"/> 62. SMDS |
| <input type="checkbox"/> 63. ATM (Asynchronous Transfer Mode) | <input type="checkbox"/> 63. ATM (Asynchronous Transfer Mode) |
| <input type="checkbox"/> 64. Matrix Switches | <input type="checkbox"/> 64. Matrix Switches |
| <input type="checkbox"/> 65. Packet Switches | <input type="checkbox"/> 65. Packet Switches |
| <input type="checkbox"/> 66. Protocol Converters | <input type="checkbox"/> 66. Protocol Converters |
| <input type="checkbox"/> 67. Diagnostic/Test Equipment | <input type="checkbox"/> 67. Diagnostic/Test Equipment |
| <input type="checkbox"/> 68. DSU/CSUs | <input type="checkbox"/> 68. DSU/CSUs |
| <input type="checkbox"/> 69. Microwave | <input type="checkbox"/> 69. Microwave |
| <input type="checkbox"/> 70. Fax Boards/Modems | <input type="checkbox"/> 70. Fax Boards/Modems |
| <input type="checkbox"/> 71. VSAT | <input type="checkbox"/> 71. VSAT |
| <input type="checkbox"/> 72. Fiber Optic | <input type="checkbox"/> 72. Fiber Optic |
| <input type="checkbox"/> 73. Satellite | <input type="checkbox"/> 73. Satellite |
| <input type="checkbox"/> 74. ISDN | <input type="checkbox"/> 74. ISDN |
| <input type="checkbox"/> 75. PBXs (over 1000 lines) | <input type="checkbox"/> 75. PBXs (over 1000 lines) |
| <input type="checkbox"/> 76. PBXs (under 1000 lines) | <input type="checkbox"/> 76. PBXs (under 1000 lines) |
| <input type="checkbox"/> 77. Automatic Call Distributors | <input type="checkbox"/> 77. Automatic Call Distributors |
| <input type="checkbox"/> 78. Voice Messaging Systems | <input type="checkbox"/> 78. Voice Messaging Systems |
| <input type="checkbox"/> 79. Videoconferencing Systems | <input type="checkbox"/> 79. Videoconferencing Systems |
| <input type="checkbox"/> 80. Voice Response/Processing | <input type="checkbox"/> 80. Voice Response/Processing |
| <input type="checkbox"/> 81. Switched Voice | <input type="checkbox"/> 81. Switched Voice |
| <input type="checkbox"/> 82. Dedicated Leased Line | <input type="checkbox"/> 82. Dedicated Leased Line |
| <input type="checkbox"/> 83. Switched Data | <input type="checkbox"/> 83. Switched Data |
| <input type="checkbox"/> 84. Centrex | <input type="checkbox"/> 84. Centrex |
| <input type="checkbox"/> 85. E-Mail/On-Line Information | <input type="checkbox"/> 85. E-Mail/On-Line Information |
| <input type="checkbox"/> 86. Image Processing | <input type="checkbox"/> 86. Image Processing |
| <input type="checkbox"/> 87. Audio Teleconferencing | <input type="checkbox"/> 87. Audio Teleconferencing |
| <input type="checkbox"/> 88. Local Services | <input type="checkbox"/> 88. Local Services |
| <input type="checkbox"/> 89. WATS MTs | <input type="checkbox"/> 89. WATS MTs |
| <input type="checkbox"/> 90. International | <input type="checkbox"/> 90. International |
| <input type="checkbox"/> 91. Virtual Networks | <input type="checkbox"/> 91. Virtual Networks |
| <input type="checkbox"/> 92. Frame Relay | <input type="checkbox"/> 92. Frame Relay |
| <input type="checkbox"/> 93. Value Added Services | <input type="checkbox"/> 93. Value Added Services |
| <input type="checkbox"/> XX. None of the above (1-93) | <input type="checkbox"/> XX. None of the above (1-93) |

7 What is the total number of A: LANs B: Workstations/Nodes in your entire organization?

- | | |
|---|---|
| LANs | Workstations/Nodes |
| A | B |
| <input type="checkbox"/> 1. 5,000+ | <input type="checkbox"/> 1. 5,000+ |
| <input type="checkbox"/> 2. 1,000 - 4,999 | <input type="checkbox"/> 2. 1,000 - 4,999 |
| <input type="checkbox"/> 3. 100 - 999 | <input type="checkbox"/> 3. 100 - 999 |
| <input type="checkbox"/> 4. 50 - 99 | <input type="checkbox"/> 4. 50 - 99 |
| <input type="checkbox"/> 5. 10 - 49 | <input type="checkbox"/> 5. 10 - 49 |
| <input type="checkbox"/> 6. 9 or Less | <input type="checkbox"/> 6. 9 or Less |

8 Which of the following network platforms are currently installed/planned in the next year?

NETWORK ARCHITECTURES

- | | |
|---|---|
| Present | Planned |
| <input type="checkbox"/> 01. SNA | <input type="checkbox"/> 01. SNA |
| <input type="checkbox"/> 02. DECNET | <input type="checkbox"/> 02. DECNET |
| <input type="checkbox"/> 03. MAP/TOP | <input type="checkbox"/> 03. MAP/TOP |
| <input type="checkbox"/> 04. TCP/IP | <input type="checkbox"/> 04. TCP/IP |
| <input type="checkbox"/> 05. DCA (Unisys) | <input type="checkbox"/> 05. DCA (Unisys) |
| <input type="checkbox"/> 06. X.25 | <input type="checkbox"/> 06. X.25 |

Present Planned

- ☐ 07. ☐ NOVELL IPX/SPX
- ☐ 08. ☐ APPC/APPN/LU 6.2
- ☐ 09. ☐ NETBIOS
- ☐ 10. ☐ OSI
- ☐ 11. ☐ APPLETALK
- ☐ 12. ☐ OTHER

LAN OPERATING SYSTEM

- ☐ 13. ☐ LOCALTALK (APPLETALK)
- ☐ 14. ☐ BANYAN (VINES)
- ☐ 15. ☐ DCA (IRMLAN)
- ☐ 16. ☐ DCA (10-NET)
- ☐ 17. ☐ IBM (LAN SERVER)
- ☐ 18. ☐ IBM (PC LAN PROGRAM)
- ☐ 19. ☐ MICROSOFT (LAN MANAGER)
- ☐ 20. ☐ UNGERMANN-BASS (NET/1)
- ☐ 21. ☐ NOVELL (NETWARE, 2.X, 3.X, 4.X)
- ☐ 22. ☐ PROTEON (PRONET)
- ☐ 23. ☐ SITKA (TOPS)
- ☐ 24. ☐ 3COM (3+, 3+OPEN)
- ☐ 25. ☐ ARTISOFT (LANTASTIC)
- ☐ 26. ☐ HAYES (LANSTEP)
- ☐ 27. ☐ DEC (PATHWORKS)
- ☐ 28. ☐ OTHER

LAN ENVIRONMENT

- ☐ 29. ☐ 4M TOKEN RING
- ☐ 30. ☐ 16M TOKEN RING
- ☐ 31. ☐ ARCNET
- ☐ 32. ☐ ETHERNET
- ☐ 33. ☐ STARLAN
- ☐ 34. ☐ FDDI
- ☐ 35. ☐ LOCALTALK
- ☐ 36. ☐ 10BASE-T
- ☐ 37. ☐ OTHER

OPERATING SYSTEM

- ☐ 38. ☐ DOS
- ☐ 39. ☐ UNIX/XENIX/AIX
- ☐ 40. ☐ OS/2
- ☐ 41. ☐ OS/2 2.X
- ☐ 42. ☐ MVS
- ☐ 43. ☐ VM
- ☐ 44. ☐ VMS
- ☐ 45. ☐ MACINTOSH
- ☐ 46. ☐ WINDOWS
- ☐ 47. ☐ WINDOWS NT
- ☐ 48. ☐ X WINDOWS
- ☐ 49. ☐ OTHER

9 For which areas outside of the U.S. do you have purchase influence? (check all that apply)

- 1. ☐ Europe
- 4. ☐ Australia
- 2. ☐ Asia
- 5. ☐ Middle East
- 3. ☐ South America
- 6. ☐ None

10 Which of the following hardware platforms is installed/planned in your company? (check all that apply)

	Mainframes Currently Installed	Planned Next Year	Minis Currently Installed	Planned Next Year
01. DEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
02. IBM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
03. AMDAHL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
04. AT&T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
05. BULL HNIS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
06. DATA GENERAL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
07. HP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
08. TANDEM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
09. UNISYS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. OTHER	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MICROCOMPUTERS

(fill in the numbers)

	NUMBER INSTALLED	NUMBER PLANNED NEXT YEAR
11. MACINTOSH 20, 30, 40		
12. MACINTOSH OTHER		
13. PCs BASED ON 80586	N/A	
14. PCs BASED ON 80486		
15. PCs BASED ON 80386		
16. PCs BASED ON 80286		
17. PCs BASED ON 8086/8088		
18. RISC / UNIX BASED WKSTNS		
19. OTHER		

11 Estimated value of networking equipment and services:

- A. Which you helped specify, recommended or approved in the last year?
- B. Which you plan to help specify, recommend or approve in the next year?

- | | |
|--|--|
| A | B |
| <input type="checkbox"/> 1. \$100 million and over | <input type="checkbox"/> 1. \$100 million and over |
| <input type="checkbox"/> 2. \$50 - \$99.9 million | <input type="checkbox"/> 2. \$50 - \$99.9 million |
| <input type="checkbox"/> 3. \$25 - \$49.9 million | <input type="checkbox"/> 3. \$25 - \$49.9 million |
| <input type="checkbox"/> 4. \$20 - \$24.9 million | <input type="checkbox"/> 4. \$20 - \$24.9 million |
| <input type="checkbox"/> 5. \$10 - \$19.9 million | <input type="checkbox"/> 5. \$10 - \$19.9 million |
| <input type="checkbox"/> 6. \$5 - \$9.9 million | <input type="checkbox"/> 6. \$5 - \$9.9 million |
| <input type="checkbox"/> 7. \$1 - \$4.9 million | <input type="checkbox"/> 7. \$1 - \$4.9 million |
| <input type="checkbox"/> 8. \$500,000 - \$999,999 | <input type="checkbox"/> 8. \$500,000 - \$999,999 |
| <input type="checkbox"/> 9. \$499,999 or less | <input type="checkbox"/> 9. \$499,999 or less |

12 Estimated gross annual revenue of your entire company/institution: (check one only)

- 1. ☐ Over \$10 billion
- 5. ☐ \$50 to \$99.9 million
- 2. ☐ \$1 to \$9.9 billion
- 6. ☐ \$10 to \$49.9 million
- 3. ☐ \$500 to \$999.9 million
- 7. ☐ \$5 to \$9.9 million
- 4. ☐ \$100 to \$499.9 million
- 8. ☐ \$4.9 million or less

13 Estimated number of employees for your entire corporation:

- 1. ☐ Over 10,000
- 4. ☐ 1,000 - 2,499
- 2. ☐ 5,000 - 9,999
- 5. ☐ 500 - 999
- 3. ☐ 2,500 - 4,999
- 6. ☐ 499 or less

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INTERNETWORKS

LAN-TO-LAN AND LAN-TO-WAN EQUIPMENT AND STRATEGIES

Worth Noting

“We are in the first lap of a long networking race that won’t stop until mainframes are completely dissolved.”

Ward Paxton
President
Optical Data Systems, Inc.
Richardson, Texas

Link Notes

Fibronics International, Inc. last week rolled out a new family of repeaters that allow Fiber Distributed Data Interface network users to extend the distance between nodes as far as 40 km and will more reliably connect single-mode remote sites to multimode FDDI backbone rings.

The FX8400 series of single mode-to-multimode repeaters includes both 20- and 40-km versions of single- and dual-attached models. Available now, they range in price from \$6,750 to \$11,000.

Separately, Fibronics announced that its research and development, manufacturing and testing facilities earned ISO 9001 quality assurance certification.

The certification is part of the International Standards Organization’s series of specifications that calls for strict adherence to quality assurance processes in design, development, production, installation and services.

Fibronics: (617) 826-0099.

Wellfleet Communications, Inc. was named the fastest growing company in America last week by *Inc. Magazine* in its annual list of the 100 fastest growing public companies.

In addition, the vendor topped *Fortune* magazine’s annual list of fastest growing

(continued on page 18)

LANart joins stackable hub fray with new product line

Hub combo supports up to 48 10Base-T nodes.

By Skip MacAskill
Senior Writer

NEEDHAM, Mass. — LANart Corp. last week threw its hat into the stackable hub market with the introduction of an Ethernet device that can be stacked with an extension to support as many as 48 10Base-T end nodes.

LANart now becomes another firm in a long string of companies trying to cash in on the stackable hub craze, including Ungermann-Bass, Inc. and NetWorth, Inc., which both made stackable roll-outs last week.

The new LANart products include the ETM2400 hub, which has 24 RJ-45 unshielded or shielded twisted-pair connections, as well as an attachment unit interface port for backbone connections and an RS-232 port

for out-of-band management. The ETM2400 can be controlled and monitored by an optional Simple Network Management Protocol feature.

The company also rolled out an optional daughterboard for the ETM2400 that gives users a choice of two additional backbone connections: a 10Base-T unshielded or shielded twisted-pair port or a 10Base2 coaxial cable connection.

The 24-port ETE2400 extension hub can be stacked on top of the ETM2400, giving users a total of 48 10Base-T connections that can be managed as one device. The ETE2400 also comes equipped with 24 RJ-45 connections for use with unshielded or shielded twisted-pair wiring, an

(continued on page 18)

Rolm jumps on internet bandwagon

By Maureen Molloy
Senior Editor

FORT LAUDERDALE, Fla. — Private branch exchange vendor Rolm jumped into the router market last week with the announcement that it will resell two inter-networking devices and a backbone switch from Netrix Corp.

The NetAsset 1000 products, introduced at the National Rolm Users Group meeting here, will enable users to link remote sites to a corporate local-area network internet as well as to circuit-switched nets. The products include an Ethernet router, a packet assembler/disassembler and a backbone circuit switching hub. Rolm has acted as an OEM for all three products from Netrix.

The NetAsset 1050 is a two-port remote Ethernet bridge/router that supports X.25 and frame relay traffic up to T-1 speeds. As many as four Ethernet daughter cards can be added to the 1050, enabling the device to support a total of five Ethernet connections. It supports the Transmission Control Protocol/Internet Protocol as well as No-

vell, Inc.’s Internetwork Packet Exchange (IPX).

Token-ring support will be added to the 1050 later this year.

The NetAsset 1100 is a PAD that supports as many as 64 terminal-to-host asynchronous connections over wide-area network links that support speeds up to 38.4K bit/sec.

NetAsset 1200 is a switching hub that combines frame relay, X.25 and time-division multiplexer technologies into a single platform. The 1200 is a backbone device that can be used for net consolidation at headquarters or regional data centers, or as an access device into public, private or hybrid WANs.

It comes in five-, seven- and 16-slot versions and supports a four-port interface that handles speeds up to 256K bit/sec and a four-port speed interface that supports speeds up to T-1.

All three models can be managed by any Simple Network Management Protocol-based net management platform and used in public, private or hybrid networks.

The NetAsset 1000 products will be available in June. The 1050 ranges in price from \$6,000 to \$9,000, while the 1100 costs between \$2,200 and \$6,000. The 1200 costs between \$1,500 and \$30,000. □

Rolm: (800) 765-6123.

“In order for a hub vendor to truly compete at the enterprise level, they need to have a full breadth of products, which would include a stackable hub offering.”

Rob Held
President and CEO
Chipcom Corp.



Stackable hubs heat up low-end market

New inexpensive hub category gives flexibility, manageability to remote sites and work groups.

By Skip MacAskill
Senior Writer

Professional basketball has given us the run-and-gun, the pick-and-roll and the give-and-go.

The networking industry has now given us the stack-and-rack.

Stackable hubs have become one of the hotter niches in the market, with vendors stepping up marketing plans and those without a stackable solution scrambling to develop one. In the last week alone LANart Corp., NetWorth, Inc. and Ungermann-Bass, Inc. rolled out new stackable hub lines.

Why all the activity? According to The Yankee Group, a market research firm in Boston, stackable hubs — devices with a fixed number of ports that can be managed as a single logical unit — accounted for only 18% of the market in 1992, but the segment is expected to grow 85% this year.

“The stackables are growing like weeds, and we expect that, over the next four or five years, the compound annual growth will be around 40%,” said Todd Dagres, vice president of data communications at the firm.

“Their market share will continue to climb because of the flexibility they offer,” he said. “Over the next several years, the networking industry will see tremendous growth in the number of remote office and departmental sites — environments that are tailor-made for the stackables.”

As those remote sites grow in number, so too will the number of vendors offering stackable products. According to Rob Held, president and chief executive of-

ficer of hub maker Chipcom Corp. — which does not currently offer a stackable line — vendors that want to be serious players in the hub market will have to offer stackables.

“In order for a hub vendor to truly compete at the enterprise level, they need to have a full breadth of products, which would include a stackable hub offering,” he said. “Developing such a line is in the cards for us.”

While vendors such as 3Com Corp. offer token-ring stackable hubs, the majority of the develop-

As remote sites grow, so too will the number of vendors offering stackable products.

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ment work has focused on Ethernet, with the ubiquity of 10Base-T serving as the primary driving factor.

“The acceptance of 10Base-T has done more than anything to fuel acceptance of these new stackable hubs,” said Kevin Woods, product marketing manager at SynOptics Communications, Inc. “There have also been tremendous improvements in the stackable hubs in terms of cost, functionality, management, media options and scalability.”

Another factor is the increasing complexity of the chassis-

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Stackable hubs heat low end

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based devices, according to Karen Oddey, product-line manager for stackable hubs at 3Com's plant in the U.K.

"The chassis hubs are getting incredibly complicated, which is not a problem for the sophisticated leading-edge users, but somewhat daunting for the small shop that is new to networking," she said. "These users want to get comfortable with the idea of a hub before making a major investment, and they don't want the cost and high level of technology that a chassis has."

Another type of user attracted to the stackable hub is one found in remote offices. Because it is expensive and time-consuming to send troubleshooters to those sites, net administrators are looking for devices that have some degree of manageability, are low cost and are easy to use.

"Our token-ring stackables are being looked at most seriously by users for branch office applications," said Pete Williams, president of Star-Tek, Inc., a wholly owned subsidiary of 3Com. "These users want the same degree of network service

that is enjoyed at the central site, so the stackable hub needs to be self-contained and offer comprehensive management."

For users, the ability to stack these devices and manage them as one logical device is a driving factor. "For me, the greatest benefit of the stackables is the flexibility it offers from a network management standpoint," said Carlos Negrete, manager of network services at PacificCare Health Systems in Cypress, Calif. "Because I only need one managed hub in each stack, it's easy for me to move the unmanaged ones around our plant as we reshuffle people and do moves, adds and changes."

This type of flexibility also makes a stackable solution a good complement to users that employ chassis-based hubs. UB, which, along with NetWorth, announced the industry's first segmentable stackable hub last week, sees stackables as a way to bridge the gap between enterprise and departmental nets.

"A department is an extension of an enterprise, which has always been our main focus, so complementing that with a departmental solution was an important move for us," said Surya Panditi, general manager of the

Access/One business unit at UB.

A collapsed backbone architecture is a good example. Users place a stackable hub on each floor of a building and tie them to a high-end router or hub/router.

Since many large companies standardize on one hub at the high end and then stay with the same vendor to provide the departmental solutions, it is necessary to have a solid chassis-based hub offering in order to win the stackable business, according to John Burnham, director of analyst relations at Cabletron.

"Decision-making has been centralized at the top level of management, which will implement one vendor's hub at the corporate LAN," he said. "The department and work group users will then become networked, and they'll likely need a stackable hub."

No matter how or where a stackable hub is used, however, its benefits are the same. For Peter Mills, head of the network unit at the University of Manchester in the U.K., manageability and cost represent the bottom line.

"When selecting a stackable hub, we looked at two criteria," he said. "We wanted something that was manageable, and we wanted something cheap." ■

LANart joins stackable fray

continued from page 17

RS-232 port and an optional SNMP agent. A 12-port version of the extension, the ETE1200, will be offered in the future.

The ETM2400 features a "joystick" switch that lets the user control the settings and functions of the hub and, if connected, the extension hub. The LED display offers a variety of net informa-

tion, including port status and the number of collisions.

The ETM2400 is available now and costs \$1,495. Available in July, the SNMP version costs \$1,995. The ETE2400 is priced at \$995 and \$1,195 for the RS-232 and SNMP versions, respectively. Availability mirrors that of the ETM2400.

The optional daughterboard costs \$195. ■

LANart: (617) 444-1994.

Link Notes

continued from page 17

companies last fall. Inc. ranked companies by their growth rate in total revenue from 1988 to 1992.

Wellfleet increased its sales by almost 27,000% from annual sales of \$320,000 in 1988 to more than \$85 million in 1992.

3Com Corp. last week announced price reductions on its LinkBuilder Flexible Media Stack (FMS) TP stackable hub and accompanying network management software products.

Beginning today, the LinkBuilder FMS TP hub costs \$995, down 10%, and the vendor's ISO-View net management software

now costs \$645.

In addition, 3Com announced a six-port fiber hub, the third member of the LinkBuilder FMS stackable hub family that will begin shipping later this month. The existing stackable hubs support twisted-pair and coaxial cable, respectively.

The FMS TP can be linked with as many as three FMS twisted-pair or coaxial hubs to form a single logical repeater. It is managed through a single user-installable management module inserted into one hub in a four-hub stack, thereby sharing management throughout the stack.

The FMS TP hub is available now.

3Com: (800) 637-3266. ■

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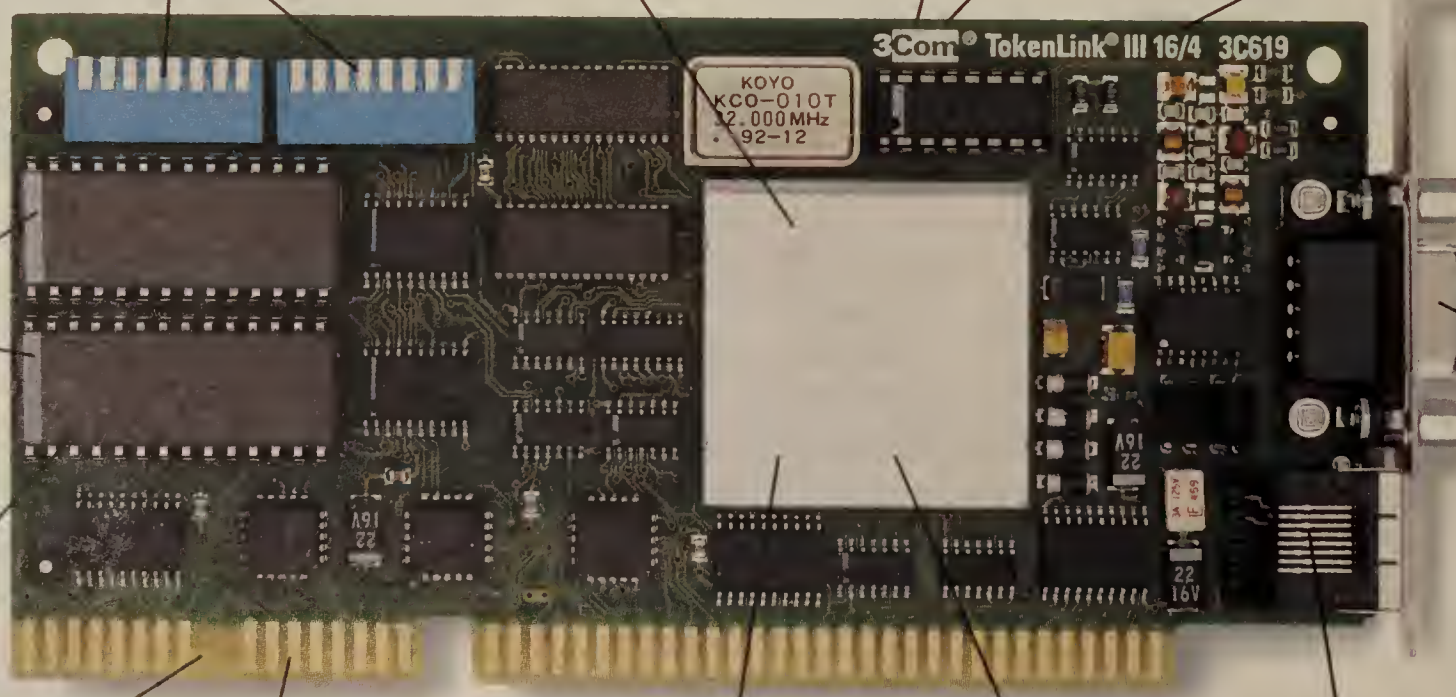
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16-bit performance. Not just 8-bit.



Sequent unveils server details

continued from page 13

The WinServer 1500 is simply the 1000 built in a bigger box, with room for 21 disks. "Its redundant power supplies make it a better choice for mission-critical applications," Gifford said. Also, it is well suited for local-area net consolidation, decision support and work group applications.

Intended for large-scale LAN consolidation, transaction processing and decision support, the WinServer 3000 is a brand-new TriCord/Sequent design. It supports as many as six 66-MHz processors, 192 disks (24 per expansion cabinet), 256M bytes of RAM (1G byte with 16M bytes of DRAM), four to 16 SCSI-2 channels, redundant power supplies, and RAID Levels 0, 1 and 5.

Disk I/O occurs on the main system bus to avoid competing with the Extended Industry Standard Architecture bus, Gifford said, which significantly improves performance in high-volume applications.

The top-of-the-line WinServer 5000 is a pure Sequent design, based on the Symmetry 750 now used in the Unix market. Targeted at mainframe-class applications,

it will initially support up to 16 50-MHz 486 chips (the architecture is scalable to 30 processors; NT allows up to 32), 768G bytes of storage, 2G bytes of RAM, up to 32 SCSI-2 channels, and RAID Levels 0, 1 and 5 in software. Hardware RAID support will be available in 1994, Gifford said.

The 1000, 1500 and 3000 will ship with Windows NT Advanced Server, but Gifford said early units are available now for customers willing to work with beta versions of Windows NT.

In usable — not stripped — configurations, the 1000 lists for \$29,900, the 1500 costs \$39,900 and the 3000 costs \$75,000, with prices increasing depending on the extras. The WinServer 5000 is due to ship in the fourth quarter at a starting price of \$246,000.

Despite these prices, Sequent plans to sell and support the new servers via a new telephone sales channel called WinCentral Direct. This channel will ship custom-configured, plug-and-play servers directly to customers. Augmenting its existing direct sales force with telemarketers indicates that Sequent sees initial sales of Windows NT coming from the low end of the market. ■

Sequent: (503) 626-5700.

Firm brings SNMP to AppleTalk

continued from page 13

able now for \$699.

For desktop Macintoshes, Farallon's new EtherMac cards are available in both NuBus and LC versions, both with a minimum of 64K RAM.

The cards are compatible with System 7 drivers, and additional software is not needed to work with SNMP or AppleTalk, said Larry Jones, Farallon's group

product manager for network systems. The new EtherMac cards will ship this month at prices ranging from \$189 to \$359.

For PowerBooks and desktop Macintoshes without a free slot, the EtherMac SCSI/PB and EtherMac SCSI/Mac adapters attach to Small Computer System Interface ports. These products are available now for both thinnet and

10Base-T media. Prices range from \$339 to \$359.

Farallon's EtherThin transceivers are designed for the ever-increasing number of Macintoshes that come with built-in Ethernet support. The new models join the company's transceivers for 10Base-T media. EtherThin transceivers will be available in June, the company said, for \$85 each. ■

Farallon: (510) 814-5200.

Novell ignites mart with software

continued from page 13

guy, director of marketing at Novell, to reestablish a host session, the user often is required to know how to navigate around the network. If the user is not network savvy, an administrator would have to reestablish the link.

"Without this, you need to fish around and see if there are sessions available," he said.

Automatic reconnection provides the protection needed by Novell customers looking for more fault-tolerant mainframe connectivity, he added.

"In a mission-critical environment like a hospital, maintaining uninterrupted services is para-

mount," agreed Greg Foster, financial systems manager at St. Vincent's Hospital in Birmingham, Ala., a beta site for the product. "Hot Standby should ensure that we have a reliable automatic reconnection to the host."

The other two new features, Hot Link and Hot Spot, help the user better integrate personal computer- and mainframe-based information.

Hot Link is basically 3270-based Dynamic Data Exchange (DDE) dynamically connecting Windows applications with host applications and data. That means any changes to host-resi-

dent applications can be automatically imported to DDE-compliant applications on the PC when the user logs on to the host.

"[Hot Links] will allow us to transparently and automatically update the data on the server databases on-line," Foster said.

With Hot Spots, a user will be able to click on a predefined area of the screen and automatically launch a mainframe-resident application without having to know often confusing 3270 commands.

NetWare 3270 LAN Workstation for Windows 1.2 is available now at \$195 for a single-user license and \$4,995 for a file server license. ■

Novell: (800) 453-1267.

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And no other IBM-compatible Token Ring adapter company has more experience in making adapters, either. More

than five million computers have been hooked up to networks using 3Com adapters.

And if all these extras sound expensive, you are in for a very pleasant surprise. 3Com® TokenLink III adapters cost less than IBM-compatible adapters while offering much more.

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GLOBAL SERVICES

DOMESTIC AND INTERNATIONAL VOICE/DATA SERVICES, ACCESS EQUIPMENT AND REGULATORY ISSUES

Worth Noting

Total U.S. revenues from voice messaging services are expected to grow from \$1.32 billion last year to \$3.33 billion in 1997, with a compound annual growth rate of 14.1% over that period, according to a report from Market Intelligence Research Corp. in Mountain View, Calif.

Carrier Watch

MCI Communications Corp. last week said it signed a multiyear contract with BankAmerica Corp. for what the carrier projects will become its largest commercial agreement. Although the value and the length of the agreement were not disclosed, MCI said the contract could be worth more than the \$250 million agreement it signed with Citicorp last year.

If MCI's projections become a reality, the carrier will have received commitments for more than a half a billion dollars and locked the nation's two largest banks into multiyear contracts.

BankAmerica said MCI will replace AT&T as its primary long-distance service provider but would not say why it decided to move. BankAmerica will continue to use some unspecified AT&T services.

MCI will provide many offerings, including MCI Virtual Network, MCI Digital Data Services and MCI Global Private net services. The bank will also use MCI's Network Management Services; MCI Forum, its teleconferencing service; and several advanced 800 services, including international toll-free service for calls from Latin America and Asia. ■

Unitel lays out nationwide public frame relay plans

Carrier sees large market throughout Canada.

By Bob Wallace
Senior Editor

TORONTO — Unitel Communications, Inc., a Canadian carrier based here, last week detailed plans for a nationwide public frame relay service that will be generally available in September.

Unitel's DataVPN Frame Relay service is based on StrataCom, Inc. multiplexers and will be linked to AT&T's InterSpan frame relay service in the U.S., allowing firms to build transborder frame relay nets. AT&T bought a 20% stake in Unitel in January for \$117 million.

"We're moving aggressively into the frame relay market because we feel that the service provides a better means than private lines or X.25 for interconnecting local-area networks," said Doug Garner, director of marketing for enhanced services at Unitel. "We see a huge business opportunity in Canada alone."

Unitel's chief rival, Stentor, has already filed a tariff for its own frame relay service, which will be available soon. MCI Communications Corp. has partnered with Stentor.

Unitel will begin a controlled introduction of DataVPN Frame Relay in July and will make the offering generally available in late

September.

Garner estimated that roughly one-third of the Canadian firms that the carrier has spoken with about DataVPN Frame Relay also have sites in the U.S.

The Canadian carrier will offer the service to users in more than 20 of Canada's largest cities.

DataVPN will support port access speeds of 56K, 64K, 112K, 128K, 168K, 192K, 224K, 256K, 320K, 336K, 384K, 448K, 512K, 576K, 640K, 672K, 768K, 896K and 1.024M bit/sec, Garner said. Unitel will offer integrated access to the service, meaning a firm could use a T-1 link to support access to frame relay and other network services.

Unitel will offer committed information rates (CIR) in 4K bit/sec increments from 4K to 1.024M bit/sec.

Like most frame relay service providers, Unitel will enable users to increase their CIRs up to 200%, Garner said, but he would not say how long the bursts could be sustained.

Unitel would not discuss cost of the service except to say it will be competitive with pricing for Stentor's frame relay service and its own private-line service. ■

Unitel: (416) 345-2000.

MCI sees light; offers 800 service guarantee for Vision

By Bob Wallace
Senior Editor

WASHINGTON, D.C. — MCI Communications Corp. last week announced a service arrangement for midsize and small businesses that provides new options for completing toll-free calls that would otherwise be lost due to unattended or busy 800 numbers.

The announcement comes just one week after AT&T announced the Never Miss A Call Guarantee, a similar plan under which AT&T provides a number of rerouting options for unanswered 800 calls (*NW*, April 26, page 21).

MCI's Vision 800 AnswerNet covers firms that use switched or dedicated access to toll-free service under its Vision offering. The

carrier said it has been providing similar rerouting options since June to firms that use its higher end 800 services.

With its arrangement, MCI guarantees one month of Vision service free if it fails to reroute calls that go unanswered.

"Without AnswerNet, crucial customer calls and potential revenue can slip by," said Scott Ross, vice president of product marketing for MCI's Business Services unit. "With AnswerNet's call delivery capabilities, every business call opportunity can always be answered."

With the MCI approach, users can have their calls delivered in one of three ways.

(continued on page 22)

Snapshot of MCI-Stentor vs. AT&T-Unitel

Attribute	MCI-Stentor	AT&T-Unitel Communications, Inc.
Architecture	3 DMS-250 switches tied to MCI's Database Access Points via X.25; Signaling System 7 (SS7) signaling between switches; DMS-100s as access and concentration layer and as international gateways.	Will keep current 3 node DMS-250 architecture plus add 2 4ESS switches and 1 5ESS tied to Canadian Network Control Points via SS7 with Transaction Capabilities Part; SS7 signaling between switches; 5ESS for operator services and calling card processing.
Features	Mostly dedicated access-based features, call routing and screening functions, switched 56K bit/sec; no switched access or network remote access; Basic Rate Interface but no Primary Rate Interface.	Mostly dedicated access-based features, call routing and screening functions, switched 56K bit/sec; no switched access or network remote access.
Billing	Stentor will bill from Business Management System platform; separate bills from U.S. and Canada for service; access not included in Advantage Vnet bills; can merge reporting data with MCI for integrated reporting.	No concrete plans yet, but AT&T-Unitel will likely have greater level of reporting integration; third-party providing joint billing and reporting services.
Network management	Only Vnet Configuration Manager for internal account teams; customer network management due by year end.	Fairly robust customer network management even in initial phases; platforms merged with U.S. network management system platforms for full cross-border reporting.
Pricing	Stentor and MCI will price their products separately.	Unitel and AT&T will price their products separately, but pricing structures will mimic one another.

SOURCE: TELECHOICE, INC., VERONA, N.J.

AT&T and MCI head north of the border

Carriers hitch up with Unitel, Stentor, respectively, to offer Canadian users first virtual net services.

By Daniel Briere
Contributing Editor

Networking between the U.S. and Canada received a big boost within the last month as AT&T and MCI Communications Corp. mapped out plans for new virtual network services with carriers in Canada.

AT&T — which teamed with Unitel Communications, Inc. — is taking a different route than MCI, which has partnered with Stentor, but in both cases the implications for network users are tremendous.

The alliances will not only bring greater networking functionality to Canada than is available today, but will also offer integrated applications support across Canadian and U.S. user sites.

While the promise of full Canadian-U.S. integration is alluring, such integration in practice is hard to achieve. Differences in customer requirements, regulatory restrictions and overall market maturity could keep services between Canada and the U.S. at different levels for at least the next few years.

"The Canadian marketplace

has to be treated as a different environment, a different culture with different requirements," said Helen Seltzer, director of network services marketing for MCI. "We are not simply taking the MCI network and dropping it in Canada."

Where MCI's alliance with Stentor is similar to a joint product development agreement, the AT&T-Unitel scale tips in AT&T's direction. AT&T has taken an ownership stake in Unitel, and Unitel consequently is importing AT&T technology into its network.

Since most of the network implementations in Canada are likely to be rather basic in the beginning, hard-core feature differences between the MCI and AT&T services are likely to be few. This will place more emphasis on service differentiation in billing, network management and customer support services.

Both combined services are heading into a market that has been dominated by Unitel's virtual network service, VRoute. Launched in 1990, VRoute today has more than 170 customers and

(continued on page 22)

AT&T, MCI head north of border

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more than 2,000 locations on its network. By comparison, Stentor's Advantage Vnet product is a relative newcomer. Unitel is walking into its deal with AT&T with 80 installed Canadian customers who have interconnections to AT&T Software-Defined Networks in the U.S.

For now, Stentor and MCI will be the first to market by about six months; they announced general availability of Phase I of their product April 6. AT&T and Unitel formally announced in March that they would begin controlled introduction of their Canadian-U.S. offering in the third quarter

of 1993, with full availability expected a few months later. By that time, MCI and Stentor will have rolled out additional options on their service, strengthening the offering relative to Unitel's and AT&T's initial service mix.

Architecturally speaking

Both carrier groups will be undergoing a substantial change in their service architectures, changes that will alter the physical path and logical way in which customer traffic is handled.

Stentor has installed a Northern Telecom, Inc. (NTI) DMS-

250 platform that matches MCI's U.S. network. Three DMS-250s in Alberta, Calgary, Montreal and Toronto will switch and process calls for the Advantage Vnet offering.

Initially, the Stentor service will be driven by customer database information loaded onto MCI Database Access Points (DAP) in the U.S. The switches communicate with the DAPs using MCI's proprietary X.25 signaling format via a signal transfer point (STP) in Canada.

"As it becomes more widespread, we'll see more functionality on Canadian soil," said Stentor's John Campbell, director of switched network services.

Signaling System 7 (SS7) will be used between the switches for trunk signaling, such as for call setup and tear down. This is the same as with MCI's network in the U.S.

Stentor was in the process of launching a product, called Virtual Corporate Network, based on an NTI DMS-100 platform. The DMS-100s will serve as facility access points and will provide trunk efficiencies, such as allowing concentration of local DS0s into DS1s for backhauling to the DMS-250s.

Stentor can use the DMS-100s

to provide a grooming layer, as well as a network maintenance point to allow direct monitoring and maintenance as close to customers as possible, Campbell said.

The DMS-100s will also act as gateway switches for international

SS7 interconnections and will be tied to STPs located in the U.S. The switches will query Network Control Point databases located in U.S.

To the customers' advantage, AT&T uses high-level layers of the SS7 protocols to perform advanced routing of calls within the AT&T-Unitel network. AT&T is the only carrier in the U.S. that uses "look ahead" routing, which enables the originating switch to look ahead through the network to determine the status of the terminating point. Based on that information, the originating switch can determine what to do with a call before sending it through the network. In the MCI and Sprint Corp. networks, the call is sent to all the points it needs to go to as the network progressively determines its path.

Unitel will continue to use its three-node DMS network (Montreal, Toronto and Vancouver). This will allow it to continue to support the Sprint Global Virtual Private Network partnership and existing connections to MCI's Virtual Network (Vnet). This DMS platform is currently connected to the 4ESS/5ESS platform.

John MacDonald, product manager for Unitel virtual network products, does not expect

Both groups will be undergoing a substantial change in their service architectures.

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al traffic. Stentor will still use the designated Canadian international carrier Teleglobe Canada, Inc. for international calls, but these DMS-100s will serve as the translation layer for Advantage Vnet-originated calls.

Unitel's new look

For its part, Unitel is placing AT&T 4ESS switches in Toronto and Vancouver, and a 5ESS switch in Montreal to handle operator services and calling card services. These switches will be linked with

MCI offers 800 guarantee

continued from page 21

With AnswerNet Message, callers hear a customized MCI-provided message (or a message created by the 800 user) that tells them to call the same number again at a specified time.

AnswerNet Mailbox reroutes unanswered calls to a voice mailbox in the MCI long-distance net. Callers are instructed to leave a

message and their calls will be returned as soon as possible.

With AnswerNet Live, calls are routed directly to MCI customer representatives who can collect important information, such as the caller's name and phone number, that the business can use later for callbacks.

MCI will soon file a tariff for the deal. AnswerNet Vision will be generally available in June. ■

MCI: (202) 872-1600.

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the two platforms to fully inter-operate for some time, possibly as late as 1996.

Reality check

The beauty of integrated architectural platforms is integrated applications support. If a customer has internal help desk applications in San Francisco, Toronto and Washington, D.C., both partnerships theoretically could offer the customer a similar line-up of features in Canada and the U.S. to support that application, including alternate destination routing and off-network overflow. Thus, callers that might have encountered a busy signal at the Washington location could be sent to the Toronto location for handling.

As always, the key will be availability of features in the Canadian environment. Technically, the Canadian platforms can support most U.S. virtual network features. However, various regulations and customer limitations will practically restrict the general availability of these features in the short term.

For instance, the current status of Dial 1 equal access in Canada precludes any trunk side switched access as part of virtual networks. Dial 1 access to the vir-

tual net is not expected until sometime in 1994, when nationwide equal access becomes available.

Manageable chunks

In the first phase of the MCI-Stentor service rollout, most dedicated access-based features from MCI's U.S. service will be available, as well as MCI's strong cadre of intelligent network screening and routing functions. They include dedicated access, uniform numbering plans, authorization codes, class of service screening and direct termination overflow.

Switched 56K bit/sec service

"It is no good having a list of features as long as your arm if you cannot support them."



will also be available, and Stentor hopes to add clear channel-switched 64K bit/sec service by this summer as part of the next phase of features. On-net and off-

net switched 64K bit/sec calling will be available, but if users call off-net, there is no guarantee of clear channel throughput.

The role of Integrated Services Digital Network within Advantage Vnet is limited due to regulatory issues. Recent regulatory decisions in Canada found that the proposed Primary Rate Interface (PRI) tariffs did not provide equivalent interconnection to Unitel's network. Instead of pushing the issue, Stentor withdrew PRI from the market until a solution could be developed.

Basic Rate Interface (BRI), however, is available with Centrex off the DMS-100 platform and will offer users voice and data as part of the service's original features. Calling card service with operator services and network remote access will be available in the second half of 1993 for Advantage Vnet.

In the end, Stentor is taking the philosophy of rolling out features in manageable chunks, for the sake of the carrier as well as its customers. "It is no good having a list of features as long as your arm if you cannot support them properly," Stentor's Campbell said. "Our phased approach will keep us in front of most customers."

Product-wise, there will be three Unitel offerings in Canada — the existing DMS-based VRoute service, a new 4ESS-based Canadian-domestic SDN offering tentatively called VRoute II, and a combined Canadian-U.S. 4ESS-based SDN product called AT&T SDN Canada.

The VRoute II product will differ from the AT&T SDN Canada offering in some key ways. The Canadian-domestic product is being designed to line up against the Stentor domestic service. The second offering, AT&T SDN Canada, will very much resemble SDN in the U.S. to address the U.S. customer familiar with U.S. virtual network product structures.

The 4ESS switches being installed in Toronto and Vancouver will be capable of offering the full SDN feature set to Canadian customers but, like Stentor, subject to regulatory forces and customer requirements.

The domestic VRoute II offering will resemble AT&T's Custom SDN in the U.S. but without the Global SDN and AT&T SDN Canada options. The feature set will be extensive, but still slightly less than that found in the AT&T SDN Canada service. Missing are service level guarantees and integrated billing, for instance.

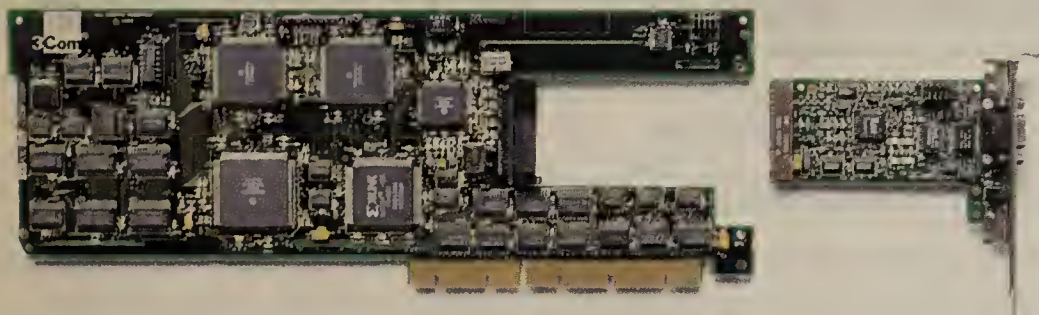
Unitel will offer some switched access functionality by the end of 1993. Unitel will use the DMS-250 platform for Feature Group A-like line-side access into all of its virtual network services. With this, a subscriber dials a local access number, enters an authorization or identification code and, upon validation, is given access to the virtual network service.

A major leg up for Stentor is the flexibility in switched data; Unitel will not offer dial-up switched 56K bit/sec service until 1994 at the earliest. Stentor, as mentioned above, offers full dial-up switched data support through BRI connections. Unitel can support switched 56K bit/sec through T-1 access, though.

Billing issues

To bill for Advantage Vnet, Stentor is using its own Business Management System (BMS). This allows for multilocation, hierarchical billing for the virtual network customers. In some ways, this billing platform exceeds the capabilities offered now by MCI. For instance, where Vnet billing allows for nine levels of hierarchy, BMS allows for 12. MCI and Stentor will not be offering a single (continued on page 42)

atch that lit the fuse that DDI revolution.



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ENTERPRISE APPLICATIONS

CLIENT/SERVER AND ENABLING SOFTWARE: DISTRIBUTED DATABASE, MESSAGING, GROUPWARE AND IMAGING

Worth Noting

“Vendors all say they are open, but we want them to be open with us.”

Ian Miller
Senior director of architecture
and emerging technology
Merck & Company, Inc.
Rahway, N.J.

Store & Forward

IBM's **Programming Systems** business unit and **Object Design, Inc.** last week announced a strategic relationship under which they will team to build object-oriented database technology.

The IBM unit will use Object Design's ObjectStore database management system for internal development and will bundle the product into some of its own offerings. IBM will also purchase an undisclosed equity stake in Object Design in Burlington, Mass.

IBM would not provide specifics about the agreement's financial terms, but an Object Design spokeswoman said the deal is worth about \$27 million, including Object Design products acquired and sold by IBM Programming Systems, as well as the equity stake.

IBM: (408) 463-4022;
Object Design: (617) 270-9797.

Pacer Software, Inc. last week announced PacerForum 2.0, a work group software package for Apple Computer, Inc. Macintosh users. New features of Pacer's client/server software include multiple views of bulletin boards, personal folders for organizing information and new administration capabilities, such as server usage displays.

PacerForum 2.0 is available now at \$549 for a five-user pack and \$1,995 for a 25-user pack. The server portion is included at no charge. Up-

(continued on page 26)

Database access pioneer fights confusion over APIs

Q+E Software states its ODBC, IDAPI position.

By Bob Brown
Senior Editor

RALEIGH, N.C. — Pioneer Software has changed its name to Q+E Software, Inc., but the company's mission remains the same: to provide application developers and users with an easy way to access multiple databases across a network.

At this week's DB/EXPO '93, Q+E Software officials will attempt to position the company's development tool as an alternative to writing directly to Microsoft Corp.'s Open Database Connectivity (ODBC) application program interface and the Integrated Database API (IDAPI) supported by Borland International Corp. and others.

“We realize that companies may not want to bet on whether Microsoft, Borland, IBM or the others are going to win this API war,” said Rowland Archer, vice president of development at Q+E Software here, which changed its name for legal and marketing reasons. “They're better off building an application layer with our product that isolates them from the outcome of that API battle.”

Version 2.0 of the Q+E Database Library database access development tool, scheduled to be officially announced and avail-

and SunSoft, Inc.'s Solaris platforms by year end.

Building applications using Q+E Database Library relieves developers from making a deci-

The Q+E Database Library eliminates the need to build to ODBC and IDAPI separately.

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sion between writing to ODBC or IDAPI since the Q+E Software product supports both specifications, Archer explained. It also saves work by eliminating the need to build to ODBC and IDAPI separately.

“The purpose of the library product is not to be a competing API, but [to have] an environment that makes it easier to develop ODBC and IDAPI applications,” Archer said. Version 2.0 of the client-based Q+E



Archer

Database Library will also enable existing applications designed with the original version of Q+E Database Library to support ODBC and IDAPI drivers.

Other advantages include the ability to use Q+E Database Library with any programming language or Windows development tool, whereas ODBC and IDAPI are designed for C developers, he said. Q+E Database Library can also shield developers from building to ODBC's multiple levels, which can be addressed differently by various database vendors' ODBC drivers.

ODBC and IDAPI should prove beneficial to users and Q+E Software. Q+E Software already supports more than 20 databases but should gain access to a few more with ODBC and IDAPI support, Archer said. As for users, “having competing standards is good,” he said. “That's what open systems is all about.” ■

Q+E Software: (919) 859-2220.

“Unlike proprietary LAN E-mail products, Novell's Message Handling Service gives users the freedom to choose among E-mail products from more than 700 developers, all of which interoperate. This is a strong message that Novell wasn't doing a good job communicating.”



John Rizzi

• Chairman
Message Handling Service Alliance
• Vice president of sales
Notework Corp.

Alliance on mission to extol MHS virtues

Hopes to tighten link between Novell and MHS product vendors, spark more industry awareness.

By Wayne Eckerson
Senior Editor

Having recently gained official legal status, the MHS Alliance is now ready to flex its muscles in the LAN E-mail market with several initiatives designed to publicize and promote the interoperability of MHS-compliant products.

In the coming year, the MHS Alliance intends to strengthen ties between Novell, Inc., which owns rights to the Message Handling Service, and more than 700 developers that build MHS-compliant products. The group also plans to hold public and private interoperability events, establish a certification program for MHS-compliant products and form working groups to address several technical issues.

Most of all, the MHS Alliance wants to spread the word about the virtues of MHS as an open electronic mail standard for local-area networks.

“Many studies have extolled the virtues of MHS as a transport for LAN E-mail, but unfortunately, we haven't done a good job telling that story yet,” said John Rizzi, chairman of the MHS Alliance and vice president of sales at Notework Corp. in Brookline, Mass.

Unlike proprietary E-mail systems, such as Lotus Development Corp.'s cc:Mail or Microsoft Corp.'s Microsoft Mail, MHS is a transport engine that supports a variety of vendors' front-end products, including E-mail clients, group schedulers and work flow tools.

Those products interoperate using MHS, giving users the freedom to choose among many vendors' products instead of being locked into products from a single vendor. MHS runs on Novell NetWare and IBM Network Basic I/O System nets.

“MHS provides true multivendor interoperability, today, now. It's not smoke and mirrors,” Rizzi said. “We need to get the word out to users about the viability of MHS as a messaging engine.”

The MHS Alliance, which comprises about 30 vendors, many of which are small companies, plans to accelerate its efforts. The group's haste is due primarily to the recognition that E-mail is about to enter a second phase of rapid growth, primarily as a vehicle for intercompany communications, according to Rizzi.

Because MHS allows multiple E-mail systems to interoperate without gateways, the MHS Alliance members believe there is a significant opportunity for them to increase their E-mail market share.

“The iron is hot; it's time to strike it,” Rizzi said. “We are small companies, and we can move quickly to take advantage of changes in the marketplace.”

Plans for 1993

After a whirlwind press tour this spring, the MHS Alliance plans to organize an interoperability demonstration at the Electronic Mail Association show in June in Atlanta. This would be similar to the interoperability ex-

(continued on page 26)

Store & Forward

continued from page 25

grades for existing users cost \$109.95 for a five-pack and \$399.95 for a 25-pack.

Pacer: (508) 898-3300.

Symbiotics, Inc., a Boston-based groupware vendor, has announced Release 1.11 of NetworksConnect, a Microsoft Corp. Windows-based groupware product. Instead of requiring a network operating system, the product uses Windows Dynamic Data Exchange for commu-

nications among computers. But the new version supports Novell, Inc.'s Internet-work Packet Exchange/Sequenced Packet Exchange (IPX/SPX) for NetWare users and Network Basic I/O System for users of IBM's LAN Server net operating system.

The software costs \$149.95; an upgrade costs \$75.

Symbiotics: (617) 876-3635.

KnowledgeWare, Inc. last week announced that it will integrate its Application Development Workbench and Object-View visual development tool for building

client/server applications.

KnowledgeWare: (404) 231-8575.

Sybase, Inc., an Emeryville, Calif., database software vendor, last week announced that the Swedish Telecom Group has standardized on Sybase's SQL Server database and Open Client and Open Server connectivity products. The telecommunications firm is moving from a mainframe-based system to a client/server architecture, a project that will cost in excess of \$100 million before completion in 1996.

Sybase: (510) 658-3500. ☐

Alliance on mission to extol MHS virtues

continued from page 25

hibition the alliance put on at NetWorld in Boston this past winter.

Besides these events, the MHS Alliance plans to sponsor two laboratory-based interoperability open houses for vendors each year. The purpose of these events will be to get vendors together to ensure that new releases of their products interoperate.

Eventually, these interoperability labs would form the basis of a formal certification program, Rizzi said. Although still in the planning stages, the program would require vendors to submit their products for testing to ensure interoperability with other MHS products.

Mail encryption

On the technical front, the MHS Alliance this year plans to establish a standard encryption method for MHS-based E-mail. Rizzi said few MHS products support encryption now, which will make it easier for all vendors to agree on a standard, probably one backed by the government.

The group also plans to form a subcommittee that will establish a standard application program interface for group schedulers so that these products can exchange information.

MHS Alliance members

Action Technologies, Inc.
Alcom Corp.
Baranof Software, Inc.
Beyond, Inc.
Campbell Services, Inc.
Castelle Corp.
CE Software Holdings, Inc.
Central Point Software, Inc.
Cheyenne Software, Inc.
CompuServe, Inc.
Computer Mail Services, Inc.
Da Vinci Systems Corp.
Futurus Corp.
Infinite Technologies
Lantec, Inc.
MacSoft, Inc.
Mastercom Consulting, Ltd.
Microsystems Software, Inc.
Mustang Software, Inc.
Notework Corp.
Novell, Inc.
OAZ Communications, Inc.
Optus Software, Inc.
Powercore International, Inc.
Reach Software Corp.
StarNine Technologies, Inc.
Transend Corp.
Wingra Technologies, Inc.
Workframe, Inc.

Additionally, the group plans to work with Novell to simplify the MHS remote E-mail module since the current remote module is too feature-rich and needs to be streamlined to improve its ease of use for end users.

"One of the problems Novell faces as the [MHS] engine builder is they are a step removed from the end user," he said. "That's why it's critical for the MHS Alliance to work closely with Novell to develop new features and functionality for MHS."

He added that Novell is welcoming their input and participation.

"Novell is the most active member of the MHS Alliance, and they have given the group considerable help in getting going," Rizzi explained. ☐

Rizzi: (617) 734-4317.

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EMBARCSM
By MOTOROLA

Circle Reader Service #15

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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS, ALLIANCES AND FINANCIALS

Worth Noting

“There is an ongoing process between the European Community and the telecom operators to identify rules for users for equipment interoperability. In some cases, the testing requirements seem to be excessive.”

Cor Berben
Head of regulatory access
to networks
Commission of the European
Community

People & Positions

Edward Lucente, formerly executive vice president of Northern Telecom, Ltd., has joined **Digital Equipment Corp.** as vice president of worldwide sales and marketing.

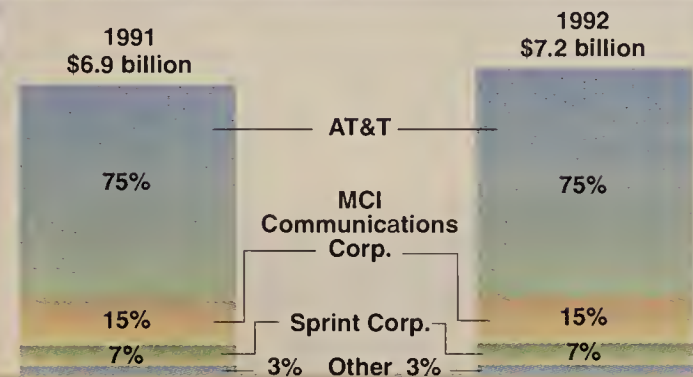
Lucente will be responsible for worldwide marketing of DEC products and services, and management of DEC sales and support organizations.

Jay Batson, formerly director of product marketing at Cayman Systems, Inc., has joined **Forrester Research, Inc.** in Cambridge, Mass., as an analyst in the consulting firm's Network Strategy Service. Batson will contribute to Forrester's "Network Strategy Report" and "Network Strategy Bulletin."

Network Equipment Technologies, Inc. (NET) has named **Maureen Lawrence** to the new position of vice president and general manager of its Adaptive Division.

This move is the result of the recently announced agreement to merge the majority-owned subsidiary, Adaptive Corp., into NET. ■

The 800 market at a glance



Although market revenues grew by \$300 million in 1992, market share remained steady due to the user-requested delay in implementation of 800-number portability.

GRAPHIC BY ANNE GIANCOLA

SOURCE: THE YANKEE GROUP, BOSTON

McCaw forms wireless data division to support CDPD

Unit will work with several vendors on rollouts.

By Ellen Messmer
Senior Correspondent

KIRKLAND, Wash. — McCaw Cellular Communications, Inc. last week announced the formation of a new wireless data business unit that will offer data packet services over McCaw's current cellular voice channels.

This August, the McCaw data division will start building support into the McCaw network for Cellular Digital Packet Data (CDPD) technology, the spectrum-sharing method developed by IBM that allows data to be sent at 19.2K bit/sec during idle times on cellular voice channels.

McCaw plans to support CDPD on 50% of its national network by year end, with all of its 105 markets supporting the technology by mid-1994.

"Wireless data will be a big part of our future as an applications company," said Craig

nior vice president and general manager, will partner with several equipment and software vendors on the CDPD rollout.

Cellular Data, Inc., Pacific Communication Sciences, Inc.

“Wireless data will be a big part of our future as an applications company.”

▲▲▲

and Steinbrecher, Inc. will supply the CDPD radio transceivers, called mobile database stations, for the network.

Retix will supply the base station with packet routing and control function software — the so-called Mobile Data-Intermediate Systems — and specialized X.400 and X.500 software for Tandem Computers, Inc.'s Integrity Fault Tolerant Unix computers.

INET, Inc. will supply customized accounting, authentication and control software.

Net administration will be handled using Microsoft Corp.'s Windows NT operating on Sequent Computer Systems, Inc. servers. Cascade Communications Corp. will supply the backbone frame relay and Asynchronous Transfer Mode switches. The firm is working with AT&T's wireless systems division on CDPD product development. ■

McCaw plans to support CDPD on 50% of its national network by year end.

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McCaw, chairman and chief executive officer of the company, which operates across the country as Cellular One. The wireless data division, which will be headed by Rob Mechaley, McCaw se-

A look behind those 800-reliability claims

Reliability statistics fly fast and furious as carrier competition heats up in the 800-number mart.

By Bob Wallace
Senior Editor

“Statistics remind me of the story about the man who drowned in a river that was an average of three feet deep.”

Toll-free service users may feel they're drowning of late in the statistics on reliability and service quality being bandied about by carriers at the dawn of the 800-portability era.

But before you buy into the statistics, it would be helpful to look at where they originate and what they really show you about one carrier vs. another. The numbers raise an intriguing debate about what exactly constitutes service quality and reliability.

In its ads, AT&T touts results of a report created by its Bell Laboratories research and development unit that claims AT&T's 800 service is more reliable than MCI Communications Corp.'s.

Blocked out

In one widely seen advertisement, for example, AT&T claims that MCI has a higher percentage of blocked calls, takes longer to complete calls and suffers a higher rate of abandoned calls. All of that, AT&T claims, costs users of MCI's 800 service a good deal of lost revenue. In addition, AT&T claims that MCI has had five times as many network outages as AT&T has incurred.

For its part, MCI offers statistics it claims are also pulled from Bell Labs' research that show both carriers complete more than 99% of their 800 calls.

AT&T would not provide *Network World* with a copy of the Bell Labs report, which was produced in the fourth quarter of last year. But in its ads, AT&T claims that 600 of every 120,000 calls placed using MCI's basic 800 service were lost due to blocking, while only 360 calls were lost to blocking with AT&T's Basic 800.

Cedric Smith, national product marketing director for 800 services at AT&T, said the 120,000 figure is based on 10,000 calls a month, which is representative of “a typical mid-

dle market-size 800 user.”

Bell Labs continually monitors and uses the networks of MCI and other carriers — which Smith declined to name — to gauge performance.

“The testing has been totally blind [because we] are testing ourselves as part of the benchmark,” Smith said. “We are making sure we are the clear owners of the tag line ‘the most reliable 800 service.’” He added that Bell Labs staffers do not know which carriers' lines are being tested until after the test is completed.

Kevin Bennis, senior vice president of marketing for business services at MCI, acknowledged that MCI provides AT&T with network services and does not contest AT&T's blocking figures.

Don't abandon me

AT&T also claims that MCI takes 25% longer to connect toll-free calls, a figure that MCI does not dispute. AT&T would not relate the figures it uses to calculate that differential, saying only that it takes slightly less than five seconds, on average, to connect an 800 call. Based on that, MCI would take just over six seconds.

Because MCI takes longer to connect calls, AT&T claims that MCI suffers a significantly higher rate of abandoned calls — which is when a caller hangs up before the 800 call is connected. AT&T says 2,520 out of every 120,000 callers to an MCI 800 number abandon their calls compared to 1,560 for AT&T.

But that is where the reliability comparison becomes fuzzy. Analysts and users say the second or so longer that it takes MCI to connect a call is not a big factor.

“Callers don't really notice a one- or two-second difference in connecting an 800 call,” said Daniel Briere, president of TeleChoice, Inc., a Verona, N.J., consultancy. “I'd be very surprised if anyone would hang up because of that extra second or so.”

Ryan James, director of telecommunications research for

(continued on page 28)

A look behind those 800-reliability claims

continued from page 27

The Yankee Group, a Boston consulting and research firm, said, "I don't think one extra second would bring on lots of abandons. But a difference of four or five seconds would create problems."

"A difference of one second isn't a tremendous amount of time," said Steve Backe, computer operations and telecommunications manager for Porsche Cars of North America, Inc. in Reno, Nev. "We're

more concerned with call completion rates because we want to make sure we're getting the best service."

Brian Brewer, director of inbound services for MCI, said AT&T's use of abandoned call figures is deceptive and he thinks users should focus on call completion rates instead.

"If you look at the blocked call figures for 120,000 calls, it shows that MCI blocked 66% more than AT&T [600 calls v. 360], which looks terrible," Brewer said. "But when you look at completed calls, we finish with a 99.5% [completion rate],

which is only .2% behind AT&T."

"Call completion is the true measure of how good a job a carrier is doing in terms of reliability," he added. "How can you test call abandonment? You'd need to perform some sort of user perception survey."

Lost in space

Brewer also criticized the manner in which AT&T presents information on blocked calls in its ads. That is because AT&T plotted MCI's 600 blocked calls on a bar chart that only went up to 1,000 calls.

"It makes people think half our calls were blocked," he said.

In its ads, AT&T builds on its blocked and abandoned call figures to demonstrate that its edge in reliability saves users money. AT&T adds the number of calls lost to blocking with abandoned calls to reach a total lost call figure for MCI of 3,120 out of 120,000 calls, compared to AT&T's 1,920.

If, as AT&T asserts, each 800 call brings in an average of \$50 in revenue, a user that selects MCI over AT&T would lose \$60,000. That figure is based on the difference in total revenue loss from blocked and abandoned calls between MCI (\$166,000) and AT&T (\$94,000), although AT&T shows only the \$60,000 figure and not the total loss figures.

Smith claimed that AT&T determined the \$50 average revenue figure after speaking with network managers from companies in different vertical industries and studying market research.

According to Briere, MCI's basic 800 rates are slightly lower than AT&T's but savings would not offset the \$60,000 loss, if that figure is accurate. But he added that it is next to impossible to determine the lost business associated with each lost call.

"People may just be calling for information rather than [to make] a transaction," Briere said. "I certainly haven't seen any research that supports any value of a lost 800 call."

In reference to major AT&T network outages in the past, MCI's Bennis said, "If the average cost per lost call is \$50, then AT&T has lost users billions of dollars in their catastrophic [network] outages."

While AT&T uses the total lost call figure to demonstrate a direct revenue loss from choosing its competitor, combining blocked and abandoned calls also raises an interesting issue of just how many calls are actually reaching the users. Based on the total lost call figures from AT&T's ads, the percentage of MCI 800 calls being answered by the user appears to drop to 97.4%, while AT&T's rate drops to 98.4%.

You're out

In its ad, AT&T also presents figures on network outages reported to the Federal Communications Commission between April 7, 1992 and March 19, 1993. In that ad, AT&T says, "Your business may also be at risk because of outages. Here are the network outages due to fiber-optic cuts reported to the FCC that lasted at least 30 minutes." MCI had 15 outages, while AT&T had three.

An AT&T spokesman said the outage reports were made voluntarily to the FCC using agency guidelines. Carriers were only asked to report fiber outages that affected 50,000 or more customers.

Because AT&T's outage figures only consider fiber cable cuts, they do not indicate outages due to other circumstances, such as problems with power, switch and digital access cross-connect systems. Given that and the limited period examined, the information sheds limited light on the issue of outages.

For example, the figures would not cover major network outages that AT&T has suffered, such as the Sept. 17, 1991, outage at an AT&T switching center in lower Manhattan that disrupted long-distance service and disrupted air traffic into and out of the city for hours. ■

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MANAGEMENT STRATEGIES

MANAGING PEOPLE AND TECHNOLOGY: USER GROUPS AND ASSOCIATIONS

Worth Noting

“Now that we’ve finished wiring the world, we have to go back and rebuild our own net infrastructure, bringing the LAN deployment we did in 1984 into the ’90s.”

Gordon Chrisman
Manager of electronic communications
Texas Instruments, Inc.
Plano, Texas

Manager Minutes

The Bell Communications Research Training and Education Center (TEC) has announced a series of seminars for companies interested in learning different ways to use national services.

Attendees will learn about applications currently available with National ISDN-1 and those that will be offered when National ISDN-2 becomes available in 1994. In addition, regional deployment plans will be reviewed.

The seminars will help users decide how to choose Integrated Services Digital Network applications that will best suit their needs and those of their customers.

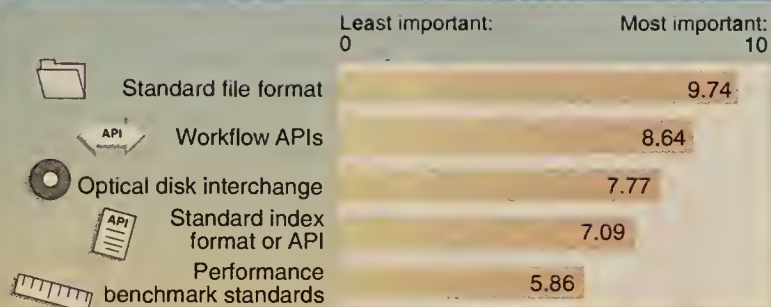
The National ISDN User Applications Seminar costs \$650 and will be offered in Atlanta on May 10-11; Phoenix on May 13-14; Boston on June 3-4; Seattle on June 24-25; and Philadelphia on July 19-20.

To register, call Bellcore TEC at (800) 832-2463. On-site registration will be accepted, based on space availability.

Six additional seminars will be offered in key cities during September and October 1993. Call Bellcore TEC for dates and locations. ■

Documenting the need

Users rate the need for document management interoperability standards:



Figures are based on a poll of 150 users of document management systems.

GRAPHIC BY ANNE GIANCOLA

SOURCE: BIS STRATEGIC DECISIONS, NORWELL, MASS.

Interoperability lacking in document mgmt. systems

Users foresee problems as usage increases.

By Joanne Cummings
Special to Network World

Document management users are learning a hard lesson as they seek to leverage the growing amount of information maintained within their systems: Sharing documents among products from different vendors is next to impossible.

Currently, several standards bodies are tackling portions of the interoperability problem. But none of the standards envisioned will enable users to share all the information contained in diverse document management systems. And that's true even if the document management systems are configured to work with the same client workstations, interfaces, local-area networks and databases.

"The situation is similar to the early days of word processing," says Bruce Silver, vice president of document imaging at BIS Strategic Decisions, a consultancy in Norwell, Mass. "If you had an IBM word processor and a Wang word processor, the way you would get a document from one to the other was to print it out and scan it in. They weren't designed to interoperate, and that's the way document systems are today."

Interoperability isn't a problem if the document management system is used within one department for one application. And, Silver says, most companies implement document management systems with a single application in mind.

But if information stored in the system needs to be used later by another department using another system, a user can quickly find itself facing a nightmare.

Betsy Fanning, manager of information resources at Westinghouse Electric Corp., says lack of interoperability between document management systems could soon have an adverse affect on business efficiency.

"Until now, this really hasn't been a problem for us. But it might be in the future," she says. "We have three or four vendors represented within the corporation, and we will need to transfer documents and images between systems."

There's no way for us to do that today."

Take the case of an insurance firm's claims department that sets up a document management system to streamline handling of paper-based forms and other information.

That's fine until the company merges with another insurer and needs to integrate claims departments. If the newly acquired company uses a different system, the integration job will be difficult, at best. Short of printing out all of the information from one system and scanning it into the

other, there is no easy method of document information interchange. Even the optical disks cannot be shared.

"For all practical purposes, you just can't interoperate (cont. on page 30)



HIRING PRACTICES

BY FRANK SCHOFF

Improve marketability by keeping skills 'young'

It is difficult to believe that in the enlightened '90s — the decade in which the graying generation will become *the* generation — there is still cause for concern over whether age is an issue when a hiring decision is made. And yet, barely a week goes by in my recruiting practice that a network professional does not raise an age-related issue.

Without a doubt, a heightened awareness of the age issue

has been triggered by recent downsizings that have focused on early retirees and more costly long-term (older) employees. However, expressions of concern are even voiced by people in their late 30s who believe

that the statement, and the resulting actions, are discriminatory. Hiring managers should step back and judge whether their preconceived image has a discriminating qualifier. If it does, they should reject it before conducting a search or making a hiring decision.

Job hunters can also be guilty of imagined age discrimination. People with careers in rapidly changing, high-technology professions, need to recognize that they

— concerning work — age more rapidly than, for example, their accounting peers.

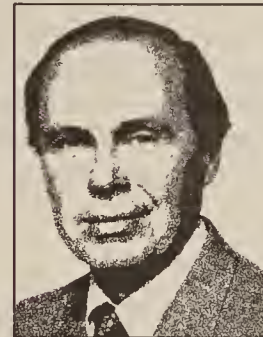
A 40-year-old network professional may have lived through four or five generations

of technology. If this person falls even one generation behind in terms of technology skills, he or she is "old" in the technological sense. Furthermore, this person's salary is likely to be high compared to other, perhaps younger, individuals with current technology skills.

Being rejected for old technology skills is not a form of age discrimination. We are in the midst of a difficult period for technologists. Although a weak economy has slowed corporate growth, technology has continued to advance. The downsized corporation has little room for old technology skills.

The best insurance against perceived age discrimination is to maintain current skills, and to be realistic concerning the value of one's skills in the marketplace. ■

Schoff is president of Management Recruiters in Cedar Mountain, N.C. He specializes in recruiting and placing network and telecommunications professionals nationwide and can be reached at (704) 884-4118.



Document mgmt. systems lacking

continued from page 29

between systems today," says Ajit Kapoor, information technology consultant and advisor on document management systems at Intelligent Solutions, a consultancy in Marshfield, Mass. "It's not impossible, but it will require a tremendous amount of systems integration and programming to make it work, and that gets to be expensive fast."

To make matters worse, standardizing on one type of document management system throughout the company won't solve the problem. Besides the fact that you may eventually want to share information with another company that uses a different system, even two systems from the same vendor cannot interchange documents easily.

For example, without a substantial amount of programming and integration work, IBM's mainframe-based ImagePlus sys-

tem cannot interchange information with an Application System/400-based ImagePlus system, Kapoor says.

Similarly, a ViewStar Corp. system may not be able to exchange documents and folders with another ViewStar system that has been configured to accept different document attribute and index information, such as type of document, creator and date created. Since these attributes are usually user-defined, they seldom map perfectly between systems, he says.

Whose fault is it?

Silver says vendors are not really interested in addressing incompatibilities, primarily because users have not been demanding interoperability.

"Document imaging isn't that widespread that people need to do a lot of interchange between systems. But we encourage users to demand that vendors get involved in some of these interoperability issues," Silver says. "Vendors have been ignoring them because nobody's refusing to buy systems if they can't inter-

operate. That's going to be a problem in the long run."

"We are looking at the issue, but it hasn't really been a priority for our users as yet," says Barbara Wehrle, corporate director of marketing at ViewStar. She says ViewStar is exploring ways that third-party vendors could solve interoperability problems by establishing bidirectional gateways between systems, but that plan is currently in the discussion stage and no products are scheduled to be announced.

Some groups are attempting to address the issue, but vendor support to date is tepid.

Take the case of the recently formed SGML Open consortium. SGML Open is attempting to tackle the interoperability problem by encouraging adoption of the Standard Generalized Markup Language (SGML) as a standard for building electronic documents.

SMGL would serve as a standard document interchange format, an interoperability feature high on users' wish lists (see graphic, page 29). Systems supporting SGML can share text documents while preserving key elements, such as type fonts, styles and formatting.

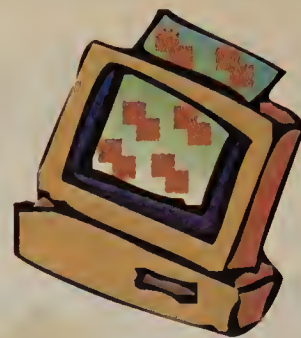
"If both systems used SGML, I

could run a document through editing tools on a character-based

terminal and know that a certain syntax denotes a paragraph," explains George Florentine, program manager at Information Dimensions, Inc., a document management systems vendor and charter member of SGML Open. "Although I can't highlight it in a color, as the originating system may have done, I can still do something meaningful with it. I know what it is."

SGML is currently limited to text information and does not provide for translating information in images, graphics and other compound document types.

"That is one of our main tasks now," says Yuri Rubinsky, president of SoftQuad, Inc., an integrator in Toronto, and chairman of SGML Open. "We'll be setting up technical committees to define exactly what we mean by in-



teroperability, as well as guidelines and vendor-neutral ways of defining how to interchange each piece of a compound document like graphics and even video."

He does not provide a time frame for these specifications, however.

Few document and image management vendors currently support SGML in their products, and, so far, few have put their support behind SGML Open. For example, the group's membership does not include such heavy hitters as Digital Equipment Corp., FileNet Corp., IBM, Keyfile Corp. or ViewStar, although it was officially chartered only last month and may eventually add some of these to its roster.

Another area needing attention is document indexing in databases. Most vendors use proprietary databases or proprietary methods for storing and accessing documents, which makes accessing documents stored in a different vendor's system next to impossible.

"The problem is those databases don't talk to each other," says Mary Bamford, industry analyst for document and image

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management at BIS. "If you've got all these different databases and different ways of accessing them, it becomes that much more complex for users to get to information. They have to go through this interface or that language or this type of query to access the data. It's not very transparent."

ANSI's emerging SQL II and SQL III standards may help by offering a standard way of storing and retrieving complex data, such as graphics, text and images.

"But I think those types of standards tend to be fairly academic," Silver says. "Vendors aren't even paying attention. It's very theoretical, and a lot of university folks are involved, but you don't hear FileNet, ViewStar and IBM saying they're going to adopt them."

SQL II and III are currently being hammered out by ANSI, and most vendors haven't pledged support for them yet.

According to Information Dimensions' Florentine, however, the standards promise to provide a degree of interoperability and many vendors are tracking the

process with interest.

Proposing a solution

There is one solution today that may help, however: a tool kit announced by IBM at this month's Association for Information and Image Management Show (AIIM) in Chicago. Under the auspices of the AIIM C15.8 standard committee, which is addressing document folder interchange standards, IBM proposed the Folder Interchange Toolkit for ImagePlus Systems.

The tool kit is a CDROM library of software modules and programs that enables users to build applications for interchanging folder information between ImagePlus systems.

According to John Segal, program manager for external alliances at IBM, the \$299 tool kit can also be used to build links into other vendors' systems.

"The user would need the appropriate data stream information from the other vendors' system in order to build the interchange solution," he says, information the user would need to garner directly from the appro-

priate vendor.

Segal says the tool kit would enable users to build applications for sharing such information as documents, which are one or more pages grouped together under a common name; document attributes, which include information such as document description and date received; folders, which are a logical grouping of documents; folder attributes, which contain information about the folder, such as creation date and creator; as well as notes, which are generally free-form text associated with documents and folders.

"IBM's at least thought about the problem, although its ability to make it stick as a standard that other people would accept is open to question," Silver says. "But at least they're trying."

Segal says ViewStar has officially sanctioned its tool kit effort and IBM has approached FileNet and Wang, although he has not received official word of their support yet.

"Except for IBM, nobody's seriously working on interoperability," Silver says. "Users want this to happen and the vendors should re-

spond to it. They should take a look at what IBM is proposing and if they don't like the specifics, at least try to modify it or offer a counter proposal. It's addressing a real user need."

Dim future

But even with the IBM proposal, the future of document management interoperability is not bright.

For vendors, providing interoperability may prove to be an expensive proposition that will require wholesale changes to the way their products work. For users, lack of interoperability, while not an immediate problem, can rapidly become one of huge proportions.

Westinghouse's Fanning says the answer lies with the vendors, who need to get together to support standards and interoperable solutions.

"I think the vendors are doing what they can," she says. "When the standards

are out and fully adopted by the vendors, I think [interchanging documents and images between systems] will be possible."

Still others feel that even with standards, these systems will never interoperate.

"We will never see true interoperability between document management systems," Intelligent Solutions' Kapoor says. "We will see increasing ease of interoperability through gateways, bridges and so on, just like traditional data networks. But seamless interoperability will never happen."

For progress to be made, observers say, users have to vote with their dollars by demanding interoperability from their vendors.

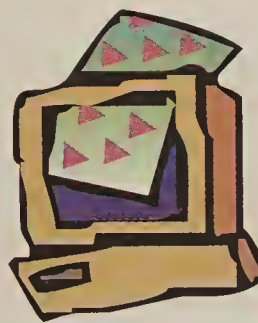
"Customers need to push the vendors more on this," Information Dimensions' Florentine says. "They have to say, 'We've done enough experimenting, and now I want the vendors to standardize this or I'm not going to buy.'"

Only then will there be real concerted action on the interoperability front, he says. ■

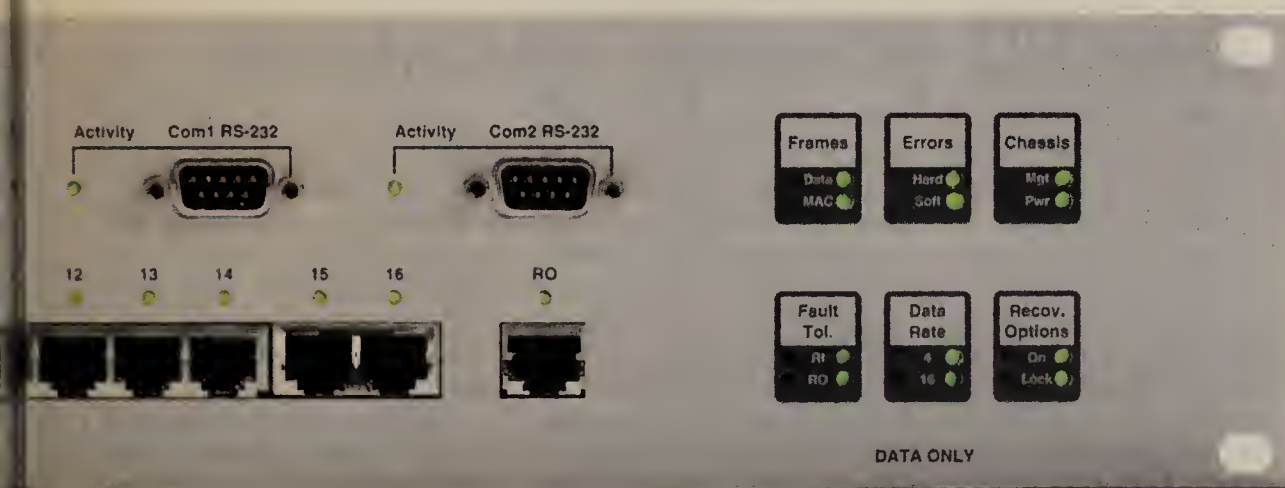
Cummings is a free-lance writer based in Marlborough, Mass.



Kapoor



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INFORMATION SECURITY

BY MICHAEL BAUM

Trusted entity debate needs user participation

Earlier this year, a new work group within the American Bar Association (ABA) met to consider an issue that could produce the network equivalent of a notary public. Network managers should monitor the ensuing debate, which centers around formation of "trusted entities."

A trusted entity is an independent, unbiased third party that contributes to the ultimate security and trustworthiness of computer-based information transfers.

For example, a trusted entity could be entrusted to time- and date-stamp a message, retain a "record copy" or digest of a transaction for dispute resolution purposes, maintain verifiable data logs, and provide assurances that a user who electronically "signs" a message using a digital signature is, in fact, who the person purports to be.

Some types of organizations that may serve as trusted entities include certified value-added networks, certain financial institutions and governmental agencies, and a new possible superclass of notaries public. The new superclass of notaries is needed because conventional notaries are legally constrained from notarizing electronic mail or electronic data interchange "documents." Thus, if conventional notaries were force-fitted to support computer-based processes and practices, they would embark upon a dangerous collision course with the law.

For this reason, the Nonrepudiation and Notarization Work Group of the Information Security Committee, EDI and Information Technology Division, Section of Science and Technology of the ABA was formed to consider requirements for notarial and trusted entity law reform. The group comprises leading U.S. and foreign notaries; public, government and private lawyers; information and security systems managers; and computer scientists.

In its first meeting, the group recognized that conventional, trusted institutions fail to fulfill the diverse and novel demands created by computer-based information, that the need for trusted entities will invariably increase and that much work lies ahead.

The work group will meet again in early July to develop, among other things, a proposed ABA resolution urging formal consideration of the roles and legal standing of trusted entities. But resolution of these issues will require the participation of providers and users from the telecommunications, technical, audit, legal, security, government and business communities.

Network managers can contribute to these efforts by communicating their views and concerns to the ABA work group or volunteering to participate.

For more information, readers can contact me at (617) 661-1234. **Z**

Baum is principal of Independent Monitoring, a Cambridge, Mass., consultancy resolving information technology legal and security issues. He also chairs the ABA's EDI and Information Technology Division, and its Information Security Committee. He can be reached at the above phone number or via the Internet at baum@bulaw1.harvard.edu.



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EDITORIAL

Gov't encryption scheme should prompt questions

The government's recently proposed encryption technology that would enable it to eavesdrop on secured communications is an interesting idea that sounds good when you wave it around in front of ideals like fighting crime, but it falls apart on further analysis.

What crook is going to use a technology that has a trapdoor for the Feds?

The idea, which is causing a stir in security circles, is to create federal encryption standards based on two chips — a private-key standard based on the Clipper Chip and a public-key complement called Capstone.

In both cases, vendors that base products on the chips would have to deliver to the government keys that can be used to

unlock any information encrypted using the devices. The keys, delivered in pairs, would be split between two government agencies, one in charge of investigations and the other in charge of protecting the rights of the public. When authorities want to eavesdrop on someone, they would need to obtain the other half of the requisite key through legal channels.

The chips and the so-called key escrow plan were developed by the National Security Agency (NSA), and now President Clinton has instructed the National Institute of Standards and Technology to base federal standards on the technology.

But there are two basic problems that Washington can't seem to answer. Unless the leg-

islative branch got behind this idea and outlawed production and ownership of all other types of encryption technology — including the Data Encryption Standard — crooks will continue to use the "secure" alternatives. So what is gained?

And the second problem is that the NSA is keeping secret the encryption algorithm used in both chips, a fact that is causing spasms in liberal, Clinton-backing circles. This is Big Brother stuff. As Mitch Kapor, chairman of the Electronic Frontier Foundation, says, "A system based on classified secret technology will not and should not gain the confidence of the American people."

We agree. This idea seems half-baked. **Z**

OPINIONS

SECURITY PERSPECTIVE

BY MICHEL KABAY

Wireless technologies require new net security policies



As data communications become more mobile, technologies such as

wireless networks and cellular telephones are becoming increasingly popular in corporate networks.

However, although these wireless technologies make remote data transmission easier, they also increase the risk of net security breaches. Net administrators and information systems managers would be wise to develop policies and implement procedures for securing mobile data links to their networks.

Several trends suggest that remote access is growing fast. For example, notebook and laptop computer sales are growing faster than sales of desktop models. Users of these portable computers often need remote access to network-based electronic mail systems.

Wireless data communications services can link even palmtop computers to messaging networks. With cellular phones decreasing in size and cost, more remote users will be employing modems via cellular phones.

International trade competition is making confidential information even more valuable to foreign companies and governments. Using unencrypted wireless communications will be like shouting messages from the rooftops.

Security problems with broadcast transmissions are not new; microwave relays and satellite transmissions, for example, are readily intercepted. A hacker named Captain Midnight broke into a program broadcast on the Home Box Office network in 1986 and broadcast his nutty

political opinions to millions of bemused viewers.

Although wireless transmission has always involved some risk, the sheer scale of wireless communications as we enter the 21st century will increase the risk of unauthorized disclosure of sensitive data and modification of critical data.

As wireless communications become more widespread, people send and receive both sensitive and critical data via mobile units. Data is classified as sensi-

monitored using inexpensive scanners available at any electronics store. In most areas of the U.S., these scanners are not yet illegal — and even if they were, determined eavesdroppers would still be using them.

Given the current lamentable state of information security awareness among most network users, we can look forward to trouble as they unknowingly use nonsecure transmissions around the country and, eventually, the world.

There are steps network administrators can take to prevent this. Organizations should classify their data and make sure the classifications are known and understood by all users. In addition, when using nonsecure transmission media for sensitive and critical data, users should automatically encrypt their transmissions once the link to their home networks has been established. Identification and authentication should be carried out only after a secure link is in place. Secure links can be established with encrypting modems and appropriate key management technology, such as handheld password generators.

The National Computer Security Association urges network administrators to train their users to employ wireless networking technologies securely. Users should have easy methods — preferably invisible to them — for preventing eavesdropping or data-diddling during their link-ups.

After all, devices don't breach security, people do.

Kabay is director of education with the National Computer Security Association in Carlisle, Pa. He can be reached on the Internet at 75300.3232@compuserve.com or by phone at (717) 258-1816.

There are so many different technical strategies, picking just one is too difficult.



tive when it must be restricted to a limited group of recipients. Data is critical when its correctness and availability affects production or decision making.

For example, emergency medical teams can download full medical files on accident victims, while field engineers can send data captured from client systems to support computers for analysis. Also, police routinely download full details about a suspect to their squad car computer. Salespeople in their cars often upload their prospect analysis to their home base for immediate discussion and receive instructions on special pricing for competitive bidding. All of this data is potentially susceptible to intrusion by unauthorized users.

Anyone thinking of transmitting sensitive data using a modem via cellular phones must remember that these calls can be

TELETOONS

BY FRANK AND TROISE

The Network Manager's Handbook: RULE 35

"Try to discourage romance in the workplace."



LETTERS

Just the latest twist

I read James Carlini's column on Certified NetWare Engineers (CNE) (NW, March 8, page 46) and the responses it generated (NW, March 29, page 41). For the record, I could not agree with Carlini more.

As a CNE, computer science graduate and veteran of 12 years in the networking industry, I have seen paper "professionals" come and go. CNEs are just the latest twist. As long as personnel managers and MIS directors continue to read the paper and not the words, this debate will continue.

David Anderson
Technology consultant
Price Waterhouse
Orlando, Fla.

Defending the judge

Like so many attacks that have been launched against the Modified Final Judgment and the judge who administers it, Alan Pearce's column calling

for U.S. District Court Judge Harold Greene to retire (NW, March 15, page 26) is unfounded and misdirected.

Pearce claims that "the Clinton-Gore administration wants to dump the MFJ" and allow the Bell companies to participate in manufacturing and long-distance services. In fact, it remains to be seen what position the administration will ultimately adopt. But there is reason to hope that Clinton's appointees will not feel compelled to follow the anti-MFJ policies established under questionable circumstances by then-Attorney General Ed Meese.

Pearce asserts that the line-of-business restrictions were imposed on the Bell companies "because there was some doubt as to whether the Bell System could be successfully split up." That is just not true. The reason for the restrictions was that the Bell companies, with their mo-

(continued on page 42)

ATTENTION INTERNET SERVICE PROVIDERS: *Network World* invites you to participate in a product survey for a Buyer's Guide to be published July 19. This Buyer's Guide will examine the critical selection criteria and current market trends that influence the purchase of Internet services.

To obtain a survey form, call Kyle Nitzsche, associate features editor, at (508) 820-7427. Requests for survey forms must be received by Monday, May 10.

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RELATIONAL

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Cutting through the thicket

Few purchasing decisions are as thorny yet as necessary as those involving relational DBMS back-end engines.

At the heart of many client/server migration efforts, the selection of relational database management system server software is one of the most significant forks on the downsizing road. Pick a relational DBMS server, and you've made a fundamental decision affecting data availability across your organization.

While the cost for a fully configured and tuned relational DBMS engine supporting thousands of users and a large database can approach \$1 million, many see this solution as more cost-effective and flexible than standing by their legacy mainframe DBMSs.

The market is responding with an increasing number of engines from which to choose. Relational DBMS back ends are maturing and now offer capabilities that make them appropriate for mission-critical applications. But these complex products are characterized by a plethora of subtle differences that make the selection process complex — and even daunting.

Buyers with a background in host-based relational DBMSs will find some of the client/server realm familiar. But they'll also find that moving to a client/

server environment opens up a new set of issues, such as the need to grapple with diverse network protocols and unfamiliar operating systems, choosing front-end application tools from a proliferating number of third-party vendors and the problems of distributed databases and database interoperability.

In the client/server model, the back end handles data management functions, performing searches, enforcing data integrity and handling simultaneous queries via locking mechanisms.

The back end provides such reliability features as data backup, disk mirroring and security control. Some back ends even support features that let a single logical database be distributed over multiple servers, potentially at different sites, though these capabilities are considered immature.

Clients run a front-end application supporting a user interface, query generation, reporting and, of course, appropriate networking software.

But between the front and back ends lies another complex and evolving mix of products and standards that must be negotiated, including multiple versions

of the SQL standard, a suite of application program interfaces (API), various gateways offered by the relational DBMS vendors and even powerful front-end tools that provide a high degree of connectivity.

At the high end of the relational DBMS engine market are products intended for high-volume, mission-critical transaction processing applications. These are designed to replace mainframes with distributed platforms by providing the reliability, integrity and performance typically associated with a mainframe application. They run over the widest range of operating systems and support most common network protocols.

High-end products generally have strong support for referential integrity and provide robust security and management features such as automatic data backup and distributed privilege control. Some offer such distributed DBMS features as two-phase commit and replication. And they often provide gateways to legacy DBMSs.

The low end of the relational DBMS engine market is defined by products that run on few or sometimes just one

Subtle product variations make DBMS server selection a thorny job.

operating system and often support only one network protocol.

Generally, there are a limited number of third-party front-end tools available for these products and no distributed DBMS capability or referential integrity support. Management, reliability and security features are also often missing.

When making a selection in this market, users should keep a basic road map of key criteria in mind: fitting in the existing network environment and supporting the right operating systems; the core functionality of the database engine, such as performance, locking mechanisms and referential integrity; client/server functionality, such as support for SQL, the breadth of third-party front-end tools available, middleware options and distributed database capabilities; system management, including reliability, maintenance and backup features; and, of course, pricing and support.

Fitting in

One of the first decisions to make when selecting a relational DBMS engine is to choose a product that runs across the appropriate operating systems and fits into the existing web of network protocols.

Relational DBMS engines that run over a wide range of operating systems

The Short List

- ☒ Cincom Systems, Inc.'s Supra Server
- ☒ Ingres' Intelligent Database 6.4
- ☒ Oracle Corp.'s Oracle 7
- ☒ Sybase, Inc.'s SQL Server 4.9.1

Complete details about The Short List appear on page 39.

provide several key advantages.

First, they are more scalable. As the database grows or as the number of users increases, the relational DBMS can be moved from a relatively small-scale operating system such as Novell, Inc.'s NetWare to a more powerful platform such as Unix.

By PAUL LI, ERIC WENDEL, JEFF HELD

Secondly, relational DBMS engines that run on several platforms enable in-house or third-party developers to design the database and write additional code on one system and then move it to a larger, fully networked production platform.

Sanju Bansal, vice president of Micro Strategy, Inc. of Wilmington, Del., a developer of client/server relational DBMS applications, appreciates Oracle Corp.'s breadth of platform support. He says developers need the freedom to work on database applications on a single-user system that is immune to network or server outages.

Oracle's Oracle 7 supports every operating system listed on the Buyer's Guide chart on page 38. As a result, the product is very scalable, with support ranging from the low-end NetWare and OS/2 platforms to mid-range Unix-based systems and all the way up to IBM mainframes.

Three other systems that support all the operating systems on the chart are Borland International, Inc.'s InterBase 3.3, Ingres' Intelligent Database 6.4 and Progress Software Corp.'s 4GL/RDBMS 6.3.

On the other side of the spectrum are products that only run over a single operating system, including all but one of Computer Associates International, Inc.'s products, Digital Equipment Corp.'s Rdb, IBM's Database 2/6000 1 and Novell's NetWare SQL 3.0.

Another factor to bear in mind is that some operating systems are inherently more capable of handling large databases than others.

For instance, information provided by vendors showed that customers with databases of 10G to 15G bytes typically use NetWare or IBM OS/2 servers. Mid-size databases of 100G bytes or less usually run on Unix or VMS. Anything larger than that is generally still handled by mainframes.

Two other factors users might want to consider are vendors' pledges to support the as yet unreleased Windows NT operating system from Microsoft Corp. and whether the database can run as a NetWare Loadable Module (NLM).

The potential advantage of Windows NT is that a wide range of systems vendors are planning to support it on their hardware. Thus, a relational DBMS that runs on NT automatically has significant scalability.

Relational DBMS engine vendors that plan to roll out products that run under NT include: Advanced Data Management, Inc., Cincom Systems, Inc., Gupta Corp., Informix Software, Inc., Ingres, Microsoft, Oracle, Pick Systems, Progress Software, Sybase, Inc. and XDB Systems, Inc.

Of the databases that support NetWare, many run as an NLM to increase performance. The exceptions to this are Computer Associates' CA-Datcom/PC 1.1, the Informix-SE 5.01 and Oracle 7.

With Unix growing increasingly im-

portant, many users will require a database that supports it.

Selecting a relational DBMS engine that supports the appropriate operating systems is critical. But it must also support the right mix of network protocols.

A comprehensive view of protocol support is shown in the chart. While some products are clearly designed for the diverse network environments found in many large corporations, others are better suited to homogeneous nets.

Two products stand out in supporting every communications protocol listed: Ingres' Intelligent Database 6.4 and Oracle 7. Progress Software's 4GL/RDBMS 6.3 supports every protocol listed except AppleTalk, while Cincom, DEC, Gupta and Microsoft support all but two or three of the listed protocols.

Meeting the core needs

Fitting the relational DBMS server into the intended environment is just the first hurdle. Other hurdles include support for such core functions as performance, SQL, query optimization, data concurrency, reliability features and the right data types.

While the question of performance figures might be high on users' lists, it's apparently low on the list of vendor answers. It is difficult to predict how well a database will perform in a particular user's environment. Thus, users planning to spend large sums on a system would be well advised to test it out first.

Other than user testing, the Transaction Processing Council publishes standard benchmark test results, though their usefulness is often debated (see story, page 37).

Fortunately, not all core features are as difficult to measure as performance.

One key feature is support for the right implementation of ANSI SQL, which is basically a language that defines how queries and updates are structured and performed across diverse back-end relational DBMSs and front-end clients.

There are several versions of SQL, the most current being the three levels of SQL 89: SQL Level 1, SQL Level 2 and SQL Level 2 with Integrity Enhancement. This last level defines an implementation of referential integrity that is based on a simple, one-time-only declaration of referential relationships, rather than the more programmatic procedural method.

Referential integrity is a key feature for databases because it ensures that related data tables — dubbed parents and

children — are appropriately updated as changes are made. Thus, if an account number is changed in one table, referential integrity automatically updates that account number in related tables.

Every vendor surveyed for this article supports some form of SQL. However, only Cincom, Computer Associates, DEC, Gupta, Hewlett-Packard Co., Informix, Oracle and Sybase support the more complex and functional ANSI Level 2 with Integrity Enhancement.

Others such as Borland, Ingres, Microsoft and Progress Software support referential integrity via the procedural alternative. While Empress Software, Inc. supports ANSI Level 1 SQL, it does not support referential integrity.

Some vendors have also developed customized extensions to standard SQL that add functionality. For example, Oracle 7 adds role-based security, which prevents access to data by any user outside of a specified group.

Another example of an SQL extension is triggers, which allow a changing database value to launch a process, such as sending an electronic mail message when the value reaches a certain limit. Products that support triggers via custom SQL extensions include those from Borland, DEC, HP, Informix and Oracle. Other custom extensions

(continued on page 36)

Relational DBMS server vendors can do better

Products from relational DBMS server vendors are not quite meeting user expectations, according to the most recent *Network World/Focus Data, Inc.* reader survey.

Asked to rate the importance of 10 key product features and their satisfaction with how their primary vendor supports these features, readers give higher importance ratings than satisfaction ratings for all but two features.

For instance, reliability is rated the most important feature, with an average score of 9.56 out of a possible 10. However, when it comes to how satisfied readers are with the level of reliability they get from vendors, the average score drops to 8.56.

After that, readers rate performance, service and support, conformance to standards and the operating environments supported as the most important features they expect a back-

end relational database management system to provide. The satisfaction scores for each of those features are lower by as much as a full point.

Only when it comes to third-party and proprietary front-end application tools do the tables turn. Readers give third-party application tool support an average importance score of 7.38 but a satisfaction score of 7.55. The average importance of proprietary front-end tool support is 5.11, while the satisfaction rating is 5.80. Both ratings are the lowest in their respective categories.

Asked to cite their primary vendor, 42% of readers name Oracle Corp., far ahead of the 17% who name Sybase, Inc. IBM is named primary vendor by 10%.

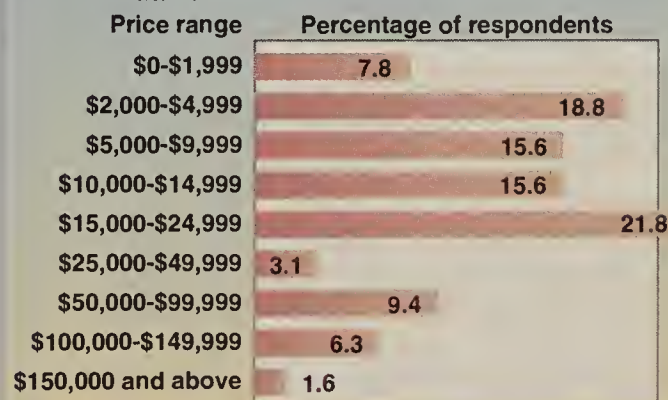
Some readers have suggestions for how vendors can better meet their needs. Many cite the need for better integration of clients and servers as well as tighter integration of diverse servers in complex networks.

"I wish they had better front end-to-back end integration so that you wouldn't have to use two vendors in front of the SQL server," one reader-

says. "That way you would avoid any confusion and finger pointing when problems arise."

While readers rank performance

What buyers want to pay for a relational DBMS server



GRAPHIC BY ANNE GIANCOLA

SOURCE: FOCUS DATA, INC., FRAMINGHAM, MASS.

the third most important feature, they express skepticism about the value of Transaction Processing Council (TPC) benchmark results. Asked how important they are in the selection process, readers give TPC benchmarks an average score of 5.46 out of a possible 10.

— Kile Nitzsche

Focus Data, Inc., a Framingham, Mass.-based market research firm, gathers data from end users to determine network and information system usage, trends, needs and satisfaction levels. For more information, call Mona Dabbon at (508) 626-2556.

Top selection criteria

Based on highest possible score of 10

Reliability	9.56
Performance	8.68
Service and support	8.67
Conformance to standards	8.46
Operating environments supported	8.19
Ease of use	8.07
Distributed DBMS	7.75
Third-party front-end tools	7.38
Price	7.23
Proprietary front-end tools	5.11

SOURCE: FOCUS DATA, INC., FRAMINGHAM, MASS.

(continued from page 35)

provide capabilities such as stored procedures and execution control through branching and looping.

Almost as important as SQL itself is the engine's ability to optimize SQL queries by determining the most efficient method of performing database searches, thereby increasing overall performance and decreasing use of system cycles.

There are two types of optimization: syntax-based and cost-based. Syntax-based optimization tends to require that a skilled programmer put together specific

rules for query optimization. However, these rules can closely match an organization's specific needs.

Cost-based optimization does not require programming. The relational DBMS simply selects what it thinks is the best method for performing a search.

Advanced Data Management, Novell and Progress Software support syntax-based optimization. Vendors supporting cost-based optimization include Borland, Computer Associates on its CA-Datcom/PC 1.1, HP, Oracle and Sybase. Some vendors support both optimization meth-

ods, including Oracle, Sybase, UniSQL, Inc. and XDB.

Locking mechanisms are the key to allowing multiple users to simultaneously access and update different parts of the same database, a capability known as data concurrency.

Databases support certain degrees of locking granularity; the higher the granularity, the faster the database performs. While most of the vendors were able to provide a high level of granularity, offering both row- and table-level locking, Ingres, Microsoft as well as Sybase

New database APIs vie for prominence

Two application program interfaces (API) that link client applications to diverse database management system servers are vying for support from relational DBMS vendors, software developers and users alike. Both APIs are implementations of the SQL Access Group's Call-Level Interface.

Microsoft Corp. is pushing its year-old Open Database Connectivity (ODBC) API, which links Microsoft Windows and Apple Computer, Inc. Macintosh applications to SQL databases. Products supporting ODBC are now hitting the market.

ODBC has two client-resident parts — the stub and a set of drivers needed to connect to various relational DBMSs. The stub is an interface between the client application and a relational DBMS driver. The driver translates ODBC-generated SQL requests to the native syntax of the target relational DBMS.

The drivers do not provide a network connection to the relational DBMS server. Instead, ODBC relies on the client's underlying network driver for communicating with the target relational DBMS server.

ODBC's contender is the brand new and still evolving Integrated Database Application Program Interface (IDAPI) specification, developed by Borland International, Inc., IBM, Novell, Inc. and WordPerfect Corp.

Unlike ODBC, IDAPI is designed to be platform-independent, meaning it is not limited to the Windows client environment. IDAPI is designed to run on either a client or server machine.

Unlike the initial ODBC specification, IDAPI is intended to work with both relational SQL DBMS servers and so-called navigational, record-oriented databases, such as Novell's Btrieve and Borland's Paradox.

IDAPI has four major parts: the IDAPI API, the object layer, the service layer and a set of DBMS drivers.

The IDAPI API provides an interface to client applications, while the object layer manages sessions with a DBMS server.

IDAPI's service layer isolates both client and server operating system functions from IDAPI functions and enables developers to build such services as international character sets, Binary Large Objects support and scrollable cursors into database applications.

The DBMS drivers provide an interface to various DBMS servers. Like ODBC, IDAPI relies on the client computer's underlying network driver for communications to the DBMS server.

Since many DBMS and client software tool vendors support both specifications, users will have their choice of which one to use.

— Jeff Held, Paul Li and Eric Wendel

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Selected TPC-A results

Hardware	Relational DBMS	TPC-A local throughput (transaction/sec)	Total system cost	Cost per transaction/sec
Hewlett-Packard Co. HP 9000 Series 800 Model H40	Informix Software, Inc. Informix-OnLine 5.0	130.46	\$1,063,239	\$8,150
	Sybase, Inc. SQL Server 4.9.1	110.53	\$937,227	\$8,479
HP 9000 Series 800 Model I40	Informix-OnLine 5.0	130.46	\$1,213,512	\$9,302
	SQL Server 4.9.1	110.53	\$971,537	\$8,790
HP 9000 Series 867S	Informix-OnLine 5.0	110.42	\$1,072,946	\$9,717
	SQL Server 4.9.1	110.53	\$919,995	\$8,323
IBM RISC System 6000/580	Informix-OnLine 5.0	120.97	\$972,823	\$8,042
	Oracle Corp. Oracle 7	157.20	\$1,442,904	\$9,179
NCR Corp. NCR 3450	Oracle 7	228.86	\$1,442,281	\$6,302
	SQL Server 4.9.1	155.75	\$1,064,117	\$6,832

SOURCE: TRANSACTION PROCESSING COUNCIL, SAN JOSE, CALIF.

Gauging DBMS server performance is tough job

Trying to ascertain the true performance of a relational database management system back-end engine is one of the great mysteries of life.

For years, vendors quoted performance figures that were often attainable only in their respective test environments.

Users had to put up with this situation until 1989, when a group of hardware and software vendors formed the nonprofit Transaction Processing Council (TPC) to standardize DBMS performance benchmark tests. But the TPC has a mixed reputation.

While the TPC is credited for standardizing three test environments, actual benchmarking is left up to the vendors, which critics say gives vendors the chance to tweak their products for optimal performance in the test environment.

Furthermore, the test environments have come under fire for not reflecting real-world conditions and, therefore, yielding misleading results.

Still, TPC benchmarks are one of the few means available to compare the performance and costs of different DBMSs.

The most widely known TPC benchmark, TPC-A, measures a DBMS's on-line processing performance in a terminal-to-host or client/server environment in transactions per second.

In the test, multiple terminals or clients tap a host or DBMS server to perform routine transactions such as reading and updating records. It also shows the total cost of the hardware, software and maintenance over a five-year period.

TPC-A results can be used to compare one DBMS to another only if the different DBMSs are tested on the same computer (see graphic on this page for

comparisons).

But in general, client/server DBMSs that turn up good results — over 100 transaction/sec — in TPC-A tests run on mid-range Unix- and VMS-based computers and include those made by Digital Equipment Corp., Informix Software, Inc., Oracle Corp. and Sybase, Inc. However, the cost of these systems is relatively high, an average of nearly \$10,000 for each transaction per second.

TPC-B is a DBMS stress test in which large batches of transactions are submitted to the DBMS and the length of time it takes to process them is measured.

As in the TPC-A results, the high-performing client/server DBMSs run on Unix and VMS platforms and include products from Gupta Corp., Hewlett-Packard Co., Informix, Oracle and Sybase.

Again, the cost for each transaction per second was high, ranging from \$3,000 to more than \$10,000.

TPC-C attempts to measure performance in a real-world scenario, a typical on-line order entry environment. So far, few vendors have submitted TPC-C results, none of which are for relational DBMSs operating in a client/server environment.

While TPC tests provide some measure of performance, many consultants, including Richard Finkelstein of Chicago-based Performance Computing, Inc., urge users to perform their own in-house benchmarks before buying.

Only then, consultants say, will users have a good understanding of a DBMS's true performance potential.

— Paul Li, Eric Wendel and Jeff Held

were not able to provide row-level locking. The three firms only go as far as table-level locking.

Two related core features are also worth consideration: autolock escalation and deadlock resolution.

Autolock escalation is the ability to aggregate multiple locked pages of data into a single locked table. While autolock escalation may have an adverse effect on concurrency by locking up more of the database than is necessary, it often results in decreased delay to end users.

More than half of the vendors offer autolock escalation, including Borland and Cincom.

Deadlock detection and resolution enables a database to break a tie when two queries are waiting for release of one locked section of a database. The only vendor surveyed that does not support this feature is Informix.

Users that know they will need to store unformatted binary data — not just letters and numbers — in their relational DBMS will be able to rule out a few vendors right off the bat.

Binary Large Objects (BLOB) are used to store such data, including images, sounds and video files. Most vendors surveyed support BLOBs, with Computer Associates, IBM, Informix, Novell and Progress Software being the exceptions.

Reliability and security

As companies move critical, core business data to local-area network-based relational DBMS servers, reliability takes on a new level of importance. The system's ability to protect critical data from loss or destruction depends on its data recovery, integrity and security capabilities.

The range of backup features supported by the relational DBMS is something users should bear in mind.

On-line backup, or the ability to back up a database onto a separate storage medium while the system is operating, is perhaps the most important. Automatic backup, or the ability to schedule and execute a backup without manual intervention, is also a key feature.

Also ranking high for some users are conditional backup, where an event triggers a backup, and incremental backup, where only a portion of the database, such as the last day's updates, are backed up. Most vendors offer on-line backup, with the exception of IBM, Informix and XDB, while many others also provide automatic backup. Less than half of the products listed offer conditional or incremental backup.

Another important reliability feature is the ability to duplicate every update performed on one disk to another local or remote

disk, dubbed local or remote disk mirroring.

About one half of the products in the chart support local disk mirroring, while only seven systems provide distributed mirroring, including those from Borland, Cincom, DEC, HP, Ingres and Progress Software, as well as Computer Associates' CA-IDMS/DB 12.0.

Maintaining control over access to certain critical data files is mandatory in most situations. Yet striking the appropriate balance between accessibility and control in any network environment is often difficult.

Today's relational DBMSs offer a number of access and control features.

All vendors surveyed offer database connection controls, which enable managers to grant or limit access to various parts of the database. Borland, Cincom, Computer Associates in its CA-IDMS/DB 12.0, Empress, Ingres, Oracle, Progress, Sybase and UniSQL offer distributed privilege controls, which enable managers to grant users such privileges as read-only access or read and write access.

About half of the vendors support journaling, which provides an audit trail of transactions that is useful when diagnosing problems.

Client/server issues

After analyzing the many factors that define core database capabilities, the next area to study is factors that define the connection between the front and back ends.

Here, users need to consider software language APIs, so-called middleware APIs and the range of third-party front-end tools that work with the relational DBMS, which together define the application development environment.

The majority of vendors provide APIs for most of the third-generation programming languages, such as C, COBOL, FORTRAN and Pascal. These are used to develop customized applications — for instance, a procedure that automatically creates and sends an electronic data interchange message to a supplier when an inventory database shows a certain item is low in stock.

Some vendors, including Borland, Empress, HP, Informix, Ingres and Sybase, provide support for more advanced programming languages, such as C++ and Ada.

Besides the programming language APIs, organizations also must consider the middleware APIs a product supports (see story, page 36).

Choosing a relational DBMS server engine that is supported by many third-party front-end tools greatly expands the options for developing applications. These tools include front-end development tools, querying tools, report writers and executive information systems.

While eight vendors say their relational DBMS engines are supported by more than 100 third-party tools, Sybase claims to be supported by more than twice

(continued on page 39)

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Relational DBMS servers

Company	Product	Server platforms						Communications protocols						SQL	Advanced recovery features	APIs	No. of front-end tools	Works with other DBMSs on:	Data fragmentation		Gateways	Protocol translation	Distributed features				Price			
		IBM host	NetWare	OS/2	Unix	VMS	Other	AppleTalk	DECnet	IPX	LU 6.2	NETBEUI	NETBIOS						TCP/IP	VINES			D = Different operating system S = Same operating system	Same server: D = Database T = Table	Other server: D = Database T = Table	D = DB2 R = Rdb S = SQL/DS		Two-phase commit	Replication	SQL: Q = Queries U = Updates D = Data dictionary Q = Query optimizer
Advanced Data Management, Inc. (800) 824-3772	DRS 4.3.1				✓	✓		✓							1, P			2	S	D, T			✓	✓		D	\$10,000-\$260,000			
Borland International, Inc. (408) 431-5165	InterBase 3.3	✓	✓	✓	✓	✓	✓	✓	✓				✓		1, 2, 8	A, D, L	I, Q, S	10	D, S	D, T		R	✓		✓	Q, U	Q	\$23,000-\$345,000		
Cincom Systems, Inc. (800) 543-3010	Supra Server	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1, 2, 2+, 8	C, D, L	Q, S	39	D	D, T	D, T	D, R, S		✓		Q, U	D, Q	\$2,000-\$150,000		
Computer Associates International, Inc. (800) 645-3003	CA-Datcom for Unix 1.0				✓								✓		1, 2, 2+, 8, P	A, L	O	25		D			✓					\$950-\$570,000		
	CA-Datcom/PC 1.1		✓								✓	✓	✓		1, 2, 2+, 8, P		O	25						✓		Q, U		\$950-\$570,000		
	CA-DB 2.0				✓	✓		✓					✓		8	A, C	D, O	8		D								\$950-\$570,000		
	CA-IDMS/DB 12.0						✓				✓				1, 2, 2+, 8, P	A, D, L	D, I, O	8		D	D	D		✓			Q	\$950-\$570,000		
	CA-IDMS for Unix 1.0				✓								✓		8	A, C	D, I, O	6		D								\$950-\$570,000		
Digital Equipment Corp. (508) 264-5306	Rdb					✓		✓	✓		✓	✓	✓	✓	1, 2, 2+, 8	A, C, D, L	D, O, S	200	D, S	D, T		D, R	✓	✓	✓	Q, U	D, Q	\$1,100-\$122,000		
Empress Software, Inc. (301) 220-1919	Empress RDBMS 6				✓	✓	✓		✓				✓		1			6	S	D	D				✓		Q, U	D, Q	\$2,100-\$672,000	
Gupta Corp. (800) 876-3267	SQLBase Server 5.1		✓	✓			✓		✓		✓	✓	✓	✓	1, 2, 2+	L	O, S	100	D, S	D, T		D	✓		✓		U		\$1,000-\$10,000	
Hewlett-Packard Co. (800) 637-7740	Allbase/SQL F.0				✓		✓		✓	✓			✓		1, 2, 2+, 8	A, D, L		22	D			D	✓		✓	✓	Q, U		\$4,000-\$67,000	
IBM (416) 448-2378	Database 2/6000 1			✓							✓	✓			1, 8	A, C		100		D		D, S	✓		✓				\$400+	
Informix Software, Inc. (800) 331-1763	Informix-SE 5.01		✓		✓		✓		✓				✓		1, 2, 2+, 8		D, O, S	180											\$1,300 +	
	Informix-OnLine 5.01		✓		✓		✓		✓			✓	✓		1, 2, 2+, 8	C, L	D, O, S	180		D, T			✓		✓		Q, U	Q	\$3,300+	
Ingres (800) 446-4737	Intelligent Database 6.4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1, P	A, C, D, L	D, O, S	27	D, S	D, T	D, T	D, R	✓		✓	✓	Q, U	D, Q	\$1,000+	
Microsoft Corp. (800) 426-9400	SQL Server 4.2			✓			✓		✓		✓	✓	✓	✓	1, 8, P	A, C, L	O, S	150	D, S	D, T		D, R, S	✓		✓		U	Q	\$1,300-\$8,000	
Novell, Inc. (512) 794-1472	NetWare SQL 3.0		✓					✓		✓					1, 2	L	D, I	80									Q, U	D, Q	\$800-\$11,000	
Oracle Corp. (800) 345-3267	Oracle 7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1, 2, 2+, 8, P	A, C, L	D, I, O, S	270	D, S	D, T	D, T	D, R, S	✓		✓	✓	Q, U	Q	\$5,000-\$200,000	
Pick Systems (714) 261-7425	Advanced Pick 6.0				✓		✓						✓		P	A, C		12											\$200-\$750,000	
Progress Software Corp. (617) 280-4700	4GL/RDBMS 6.3	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	1, 2	A, C, D, L		10	D, S	D	D	R							\$1,200-\$334,000	
Software AG of North America, Inc. (703) 860-5050	Adabas 5.2.4	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓	1, 2, 8, P	A, C, L	D, I, O	15		D, T	D, T	D, R, S			✓	✓	Q, U	D, Q	\$500-\$480,000	
Sybase, Inc. (800) 879-2273	SQL Server 4.9.1		✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	1, 2, 2+, 8, P	A, C, L	D	600	D, S	D, T	D, T	D, R	✓		✓	✓	Q, U	D, Q	\$1,500-\$256,000	
UniSQL, Inc. (512) 343-7297	UniSQL/M Multidatabase System 1				✓		✓						✓		1, 2	A		8	D, S	D, T	D, T					✓	✓	Q, U	D, Q	\$4,000+
	UniSQL/X Database Management System 1.2.1				✓		✓						✓		1, 2	A		8								✓				\$4,000+
XDB Systems, Inc. (301) 317-6800	XDB-Server for Unix 2.41				✓		✓				✓		✓		1, 8		I, O	40											\$2,500-\$72,000	
	XDB-Server for OS/2 2.0 3.2			✓			✓						✓		1, 8		I, O	50	D			D, S	✓				Q		\$1,000-\$28,000	

Products highlighted by color were selected for The Short List.

CLI = Call-Level Interface
 DAL = Data Access Language
 IDAPI = Integrated Database Application Program Interface
 NETBEUI = NETBIOS Extended User Interface
 ODBC = Open Database Connectivity
 SAG = SQL Access Group

SOURCE: ERNST & YOUNG, VIENNA, VA.

(continued from page 37)

any other, with 600 tools available. Vendors claiming more than 100 include DEC, Gupta, IBM, Informix, Ingres, Microsoft, Oracle and Sybase.

Some vendors, including Empress, Progress Software and UniSQL, only work with proprietary tools.

While client/server relational DBMSs may be getting a lot of hype, many customers have — and will continue to have — legacy databases. These users may want to consider whether the relational DBMS provides appropriate gateways to their legacy databases.

With such gateways, the client can request data from a back-end server, which can then retrieve it from the host and pass it back to the client. Several vendors, including Cincom, Ingres, Microsoft and Oracle, offer gateways to IBM DB2 and DEC Rdb databases. Ingres has gateways to RMS, IMS and VSAM flat file databases.

An emerging class of middleware products can play an important role in linking diverse front ends with varying relational and legacy back ends. These products broker between different levels of SQL, different vendors' custom SQL extensions and various network protocols.

Vendors whose databases are supported by several middleware products include IBM, Ingres, Microsoft and Oracle. Examples of these middleware products are

DEC's Accessworks, Information Builders, Inc.'s Enterprise Data Access/SQL and Oracle's Glue.

Distributed data

While client/server implementations are mature enough for many users to entrust their critical applications to them, few users are taking the leap into the new field of distributed DBMS.

But vendors have been duking it out over their various products' support for distributed DBMS features for some time.

At the center of that battle has been the two-phase commit protocol and its new rival, replication services. Both hold the promise of assuring database synchronization, meaning all the parts of a logical database spread over multiple servers will reflect the most up-to-date data.

Two-phase commit accomplishes this with an all-or-nothing approach. Every server that holds a portion of the database to be affected by an update must be able to complete the transaction or else the entire transaction will abort. This approach, which is supported by most products, tends to tie up resources and expensive wide-area network bandwidth.

The newer replication services approach allows duplicated portions of the database to be temporarily out of synchronization. Periodically, the portions update one another, resulting in a fully synchronized database.

This approach does not tie up resources as much, but there will be times when portions of the database are out of synchronization — an unacceptable situation for some customers. Replication services are supported by Advanced Data Management, DEC, Gupta, HP, Ingres, Oracle, Sybase and UniSQL.

Two other key distributed DBMS features are global data dictionaries, which give programmers creating front-end applications knowledge about the structure of the distributed data, and global data directories, which automatically give the location of the data.

Only a third of the vendors listed have these capabilities, including Advanced Data Management, Cincom, DEC, Ingres, Sybase and UniSQL. Oracle and Progress Software support global directories but not global dictionaries.

Just as in a stand-alone DBMS, query optimization is a key factor in determining the cost of the query and the delay it entails in a distributed DBMS. Distributed query optimization can either be syntax-based or cost-based. But with distributed DBMSs, the ability to assess the cost of the various possible network links can result in significant savings.

About one-third of the vendors support cost-based or syntax-based distributed query optimization, including Borland, Cincom, DEC, Empress, Informix

in its Informix-OnLine 5.01, Ingres, Microsoft, Novell, Oracle, Progress Software, Software AG, Sybase and UniSQL.

Pricing

Pricing for back-end relational DBMSs ranges significantly. The core back-end software can cost anywhere from several hundred dollars to more than half a million dollars.

However, the cost of the back-end software is only one part of the overall investment. Other parts include the cost of front-end tools and applications, database configuration, and database tuning and support services.

A final cost of \$1 million or more for the largest and most capable systems is not unusual. Price, however, is a relatively small factor in the selection process for these products, which support key business applications.

Another factor influencing the price of relational DBMS engines is the number of users they will support. Some licenses provide pricing options for various specified numbers of users, while others have an option for an unlimited number of users.

What's ahead?

Three key trends that are pick-

ing up steam will likely influence the way users purchase relational DBMS engines.

Most major relational DBMS server products are being ported to a range of platforms that offer varying levels of performance.

This means more and more products will be scalable, which will enable customers to focus on other, more critical features.

The revving interoperability arena that includes everything from APIs to third-party products will help users knit together continually more diverse clients and back ends as well as even mainframe DBMSs.

Finally, the separation of the front-end and back-end markets will continue, with increasingly competent and diversified tools coming

to market.

While the quality and variety of third-party tools is impressive today, these tools will continue to improve and will eventually force relational DBMS vendors to focus on the back-end engine market. □

Li and Wendel are managers and Held is a partner at Ernst & Young's National Technology Services Organization. They can be reached at (703) 903-5000.

The Short List: Relational DBMS servers



The Short List highlights products Network World recommends you examine during the purchasing process for relational database management system servers. Products on the list were selected based on their support for a wide range of operating systems and network protocols; SQL; reliability features; interoperability features; and distributed DBMS functionality.

■ **Cincom Systems, Inc.'s Supra Server.** Supra Server supports a broad range of features useful in enterprise environments. It runs over most key operating systems and supports most network protocols, although it does not run on Novell, Inc. NetWare or Apple Computer, Inc. AppleTalk networks. The product supports SQL Level 2 with Integrity Enhancement and three out of four key advanced recovery features. It offers gateways to IBM's DB2 and SQL/DS as well as to Digital Equipment Corp.'s Rdb. It also provides distributed DBMS functionality via two-phase commit but not via replication services.

■ **Ingres' Intelligent Database 6.4.** Intelligent Database 6.4 supports every key operating system and network protocol. The product offers strong advanced recovery features, including automatic and conditional data backup. On the distributed DBMS front, the product supports both two-phase commit and replication services. Interoperability features are strong with gateways to DB2 and Rdb. However, Intelligent Database 6.4 only has SQL Level 1 support and works with just 27 front-end tools.

■ **Oracle Corp.'s Oracle 7.** This latest version of the old standard remains a key player, with broad support for every criterion. It runs on all major operating systems and supports every key network protocol. It also supports the most robust level of SQL, has strong advanced recovery features, works with 270 front-end tools, and has several gateways and data distribution features. However, the product does not yet support a global data dictionary, a key distributed DBMS feature.

■ **Sybase, Inc.'s SQL Server 4.9.1.** SQL Server 4.9.1 offers solid support of features important for downsizing in a large and diverse environment. Sybase claims that more than 600 front-end tools work with the product, more than twice that of any other relational DBMS server. While SQL Server 4.9.1 does not run on an IBM mainframe, it supports the many key operating systems and network protocols, excepting IBM mainframes, AppleTalk, Network Basic I/O System and LU 6.2. The product offers a strong suite of advanced recovery capabilities, is highly functional in a distributed environment and provides gateways to DB2 and Rdb. □

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NetWare users getting directory assistance



Managers looking to add robust directory services to sprawling Novell, Inc. NetWare networks have a few places they can turn for help.

If they want to preserve their investments in NetWare 2.X and 3.X networks, managers can buy Banyan Systems, Inc.'s Enterprise Network Services (ENS) for NetWare, which includes a version of the StreetTalk directory found in Banyan's VINES network operating system.

Recent tests conducted by *Network World* Test Alliance member Focus Software, Inc. found ENS for NetWare lives up to its billing by providing a global, distributed directory with more advanced features than the simple bindery service used in Net-

NDS promise to significantly change the way end users and network managers view and access network resources. But the products are currently unable to interoperate, so net managers must choose one over the other.

ENS for NetWare runs on a server that is also running a scaled-down version of VINES. The VINES operating system, in turn, uses Novell's Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocols to communicate with ENS for NetWare agent software running on NetWare servers.

These agents are implemented as a value-added process (VAP) for NetWare 2.X and as a NetWare Loadable Module (NLM) for NetWare 3.X.

Clients run a terminate-and-stay-resident (TSR) program

this page).

Test results

Focus Software set up a test network consisting of a single ENS for NetWare server connected to three NetWare servers and three DOS and Microsoft Corp. Windows-based clients. The NetWare servers ran three versions of NetWare — 2.15, 2.2 and 3.11. A NetWare 4.0 server was also installed on the network, not to test interoperability but to demonstrate peaceful coexistence.

The hardware requirements of ENS for NetWare servers — like those for NetWare servers — are very specific. Only Banyan-certified personal computers and net-

On the fifth try, the test team successfully installed ENS for NetWare on a PC Brand, Inc. PC with 16M bytes of RAM and an IDE disk but only after replacing the Ethernet card with one of the four supported Ethernet adapters — a 3Com Corp. 3C503.

The test team continued to use the noncertified PC to run ENS for NetWare and didn't have any problems with it. But the testers suggest that network managers do not run ENS for NetWare on a noncertified PC because Banyan support personnel will likely suggest replacing noncertified hardware as a first step in resolving any problems.

After the ENS for NetWare server code was installed, the test team installed ENS for NetWare agents on the NetWare servers. Two of the NetWare servers were configured with numerous users in order to test ENS for NetWare's StreetTalk Integration (STI) utility. STI is software for transferring existing bindery information to a StreetTalk directory.

The third NetWare server was populated with user file volumes after STI was used to pull bindery information from the other two servers. This was done in order to test ENS for NetWare features for managing installation of new NetWare servers.

One undocumented limitation was the inability to install ENS for NetWare agent software on a nondedicated NetWare 286 server, which allows a server to double as a DOS client.

Banyan could not provide an explanation for the failure, but every time the ENS for NetWare server attempted to connect to the ENS for NetWare agent software running on the nondedicated NetWare 286 server, the test team got an "Unable to attach to server" error message and the nondedicated NetWare 286 server crashed.

After struggling with this for some time, the test team gave up and reinstalled the NetWare server as a dedicated server.

Aside from this problem, the installation of ENS for NetWare agent software was easy and should be familiar to anyone experienced with NetWare VAPs and NLMs.

Installation of ENS for NetWare on a server adds ELOGIN and BANV programs to the server-based NetWare SYS:LOGIN directory.

ELOGIN code logs clients on to a single ENS for NetWare server, which, in turn, logs them on to any other ENS for NetWare servers as well as NetWare servers. BANV code is downloaded to clients logging on to the ENS for NetWare server.

ENS for NetWare client setup involves changing network initialization scripts, which are usually part of an AUTOEXEC.BAT file. The change can be as simple as executing the commands needed to run BANV and ELOGIN after the existing NetWare NETX shell is loaded.

The test team didn't run into any problems in getting ENS for NetWare client software to work on DOS and Windows clients. However, there were problems in getting ENS for NetWare client software to work with Microsoft Windows for Workgroups 3.1.

Every time Windows for Workgroup's File Manager component was started on the client, it encountered a problem in addressing client memory in the ENS for NetWare network driver code and the client crashed. Again, Banyan could not specify why the problem occurred.

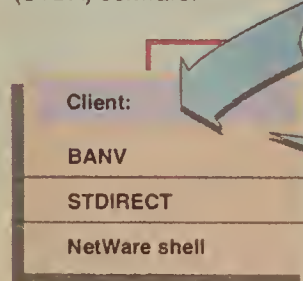
Name talk

Once the software installation was complete, the test team used STI without major problems to pull bindery information from the two NetWare servers to the ENS for NetWare server via a process that turns NetWare user and group names into StreetTalk lists, which are then stored in the StreetTalk database.

STI cannot extract NetWare volume, printer or print queue

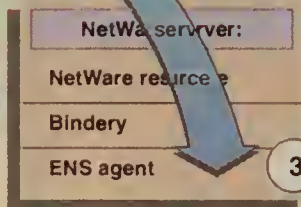
ENS for NetWare at work

1. Client accesses the Enterprise Network Services (ENS) for NetWare server using BANV software and activates STDIRECT software to select a resource name from a scrolling list downloaded from the server by StreetTalk Directory Assistant (STDA) software.



ENS for NetWare server:
STDA
StreetTalk database

2. ENS for NetWare server consults the StreetTalk database to locate the selected resource and converts the StreetTalk name to the NetWare bindery name. This name is then forwarded to ENS agent software on the target NetWare server.



3. ENS agent software logs client on to the NetWare server.

4. Client uses NetWare to access the resource on the NetWare server.

GRAPHIC BY ANNE GIANCOLA

SOURCE: FOCUS SOFTWARE, INC., SALEM, N.H.

Ware 2.X and 3.X.

The ENS for NetWare product includes security and network management facilities, but those tools take a back seat in importance to the directory services.

Alternatively, managers can lay out the cash to upgrade to NetWare 4.0 and its NetWare Directory Services (NDS). NetWare 4.0 just completed beta testing and will be featured in a *Network World*/Focus Software test article next month. The first release of NetWare 4.0 does not support NDS on NetWare 2.X and 3.X.

Both ENS for NetWare and

called BANV to communicate with an ENS for NetWare server. BANV runs in addition to the standard NetWare IPX network driver and shell used to access NetWare file and print services.

Users log on to an ENS for NetWare server and use it to reach resources on any NetWare server they are permitted to access. ENS for NetWare hides the details of NetWare access from the user.

For instance, ENS for NetWare creates NetWare user accounts for the user on target NetWare servers and logs the user on to the NetWare servers (see graphic,

work adapters are supported.

The general requirements for ENS for NetWare are an Intel Corp. 80386 or 80486 processor, at least 8M bytes of random access memory and an 80M-byte hard disk.

Because it never takes vendor documentation at face value, the test team tried to install ENS for NetWare on typical Intel 80386 PCs with various hard disk types and network cards. But it went one for five; the first four attempts failed, mostly due to incompatible hard disks and network adapters.

Banyan provides robust directory services to existing NetWare networks, while Novell requires upgrade to NetWare 4.0.

names from NetWare servers. This forces network managers to use other ENS for NetWare utilities to manually create StreetTalk names that represent these queue names and put them into the StreetTalk database. Populating the StreetTalk database enables ENS for NetWare to convert a StreetTalk name into the appropriate NetWare name.

StreetTalk names obviate the need for users to know which NetWare server has a needed resource. For example, to look through the list of jobs in a print queue for a printer assigned to the engineering department, a user enters the print queue's StreetTalk name — for instance, "Laser Printer 1@Engineering-@FocusHQ" — on the client.

ENS for NetWare locates the appropriate NetWare server and forwards the request. If the print queue is transferred to a different server, the same name can be used to access it.

What is striking about this name is its length. ENS for NetWare names can be as many as 63 characters, including the two @ characters that are used to divide the name into three parts. The first portion of the name, called the item part, can be 31 characters long and can be used to define a particular user or resource.

The other two segments — the group and organization parts — are 15 characters each.

The group part is used to group similar users and resources, such as all engineers and engineering department resources. The organization part is used to partition groups from each other.

Banyan recommends that small organizations use one name. Multiple organization names can be used to reflect geographically separate parts of a larger organization.

This fixed three-part structure is more limited than the general, X.500-type, arbitrary-depth naming hierarchy supported in Novell's NDS.

StreetTalk names can contain spaces or essentially any printable characters, even 8-bit Latin 1 characters with diacritical marks common in non-English languages. NDS names, on the other

hand, are even more flexible, with each component of the name having as many as 64 characters. NDS also supports two-byte-long UNICODE characters, giving it the ability to support multiple languages.

Using the names in the StreetTalk directory, the test team encountered no problems in accessing files and print queues on NetWare servers or accessing NetWare server-attached printers.

While the length of StreetTalk names allows for descriptive and natural names for network resources, it requires users to type all the characters. To minimize this typing, ENS for NetWare includes a StreetTalk Directory Assistant (STDA) utility, which enables users to simply select names from a list scrolling on the client screen.

STDA consists of ENS for NetWare server-based software that taps into the StreetTalk database to create a separate master database of directory information.

This separate master database can be distributed to satellite ENS for NetWare servers, making it possible for users to find a directory entry by tapping into a local rather than remote ENS for NetWare server.

A client-based TSR called STDIRECT provides the user interface to the STDA. STDIRECT enables users to hit a hot key to access a pop-up window that displays a scrolling list of StreetTalk names downloaded from the STDA database. Users can then select a name from that list.

In the Windows environment, the hot-key activation for STDIRECT results in problems if the DOS window it popped is not closed promptly. STDIRECT will start timing out and losing its connections to the ENS for NetWare server.

The STDA divides StreetTalk names into classes, for instance, putting all printer names into one class so users looking for a printer will not need to search through a list of user names.

One documented capability of STDIRECT the test team could not make work as advertised was searching across class types. Name classes are: File Volumes,

Lists, Other Services, Printers and User Names. The test team was also unable to use the documented ability to redefine the hot key used to activate STDIRECT.

In addition, testing revealed that Windows clients operating in enhanced 386 mode need to change their network driver entry in the SYSTEM.INI file to support ENS for NetWare and add a new driver that supports DOS' 25th-line messaging feature.

The 25th line of DOS is where error messages and user-to-user messaging in ENS for NetWare appear. Because the line is a character-mode display, it needs to be emulated in a pop-up window in the Windows environment.

Once the 25th line has been added, Windows clients are given StreetTalk names in Network Connection dialogue boxes.

Stored data

Testing proved that StreetTalk is indeed a global, distributed and transparent product. But it also confirmed that StreetTalk is not replicated.

NetWare 4.0 has features to replicate the NDS database across NetWare servers, which provides a greater measure of robustness. However, true NDS fault tolerance requires implementing NetWare's disk mirroring features.

The information stored by the STDA database on various ENS for NetWare servers can be duplicated over multiple servers, but this is primarily a performance feature, not a fault tolerance one.

Copies of the STDA database can be out of date since they are usually updated only once a day. To reflect changes made to names in the StreetTalk directory on one server across all others, the master STDA database is rebuilt by pulling data from the StreetTalk directory on all ENS for NetWare servers.

There are management facilities for controlling the distribution of the STDA information and for defining specific subsets of the database to distribute to satellite servers. These facilities help avoid swamping wide-area network connections between ENS for NetWare servers.

To provide some level of fault

tolerance, Banyan recommends using a separate tape backup for each ENS for NetWare server. The tape drives for each server should be physically compatible with each other because the only way to move core StreetTalk database information from one server to another is via tape backup and restore.

ENS for NetWare does not yet support remote backup of ENS for NetWare servers, while NetWare 4.0 does.

The server was crashed to test ENS for NetWare's recovery features, and the result was not good. Crashing the server breaks the communications session between BANV and the ENS for NetWare server.

When the server came back on-line, clients had to reboot in order to load a fresh copy of BANV and open a new communications session because ENS for NetWare is unable to reestablish broken connections.

However, while the ENS for NetWare server was down, clients could access NetWare servers directly. They just needed to use NetWare commands to do so.

Deployment issues

Network managers interested in deploying ENS for NetWare should be aware of some of its limitations. Banyan says each ENS for NetWare server can support up to eight NetWare servers, although the actual limit depends on the number of users and their use of ENS for NetWare features.

ENS for NetWare servers do not have to be on the same local-area network segment as the Net-

Ware servers, but Banyan suggests that they be no more than one router hop away.

Multiple ENS for NetWare servers can be used to support large networks. In this case, StreetTalk directory is partitioned according to the group part of StreetTalk names, with each ENS for NetWare server maintaining a subset of the existing groups. Only 25 groups can be supported by each ENS for NetWare server, and each NetWare server requires its own group name.

ENS for NetWare servers exchange information with one another using VINES rather than IPX, which could be an important issue because network managers must have a working knowledge of two protocols instead of one. But, of course, this would not be a problem for network managers who already use both VINES and IPX.

The information that servers exchange details which ENS for NetWare server is responsible for which group and is updated automatically when any ENS for NetWare server reboots. This traffic should not affect network performance since the complete databases are not exchanged.

As an option to routing VINES between ENS for NetWare servers over wide-area links, network managers can encapsulate VINES in IPX, Transmission Control Protocol/Internet Protocol or Systems Network Architecture packets. Likewise, IPX, AppleTalk and TCP/IP can be encapsulated in VINES.

(continued on page 42)

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AT&T, MCI head north of border

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gle bill to customers in the initial service; that will come later.

While BMS cannot match the full range of reporting capabilities offered by MCI's Vnet billing platforms, its management reports package nonetheless offers very readable, spacious reporting. In fact, the reporting formats resemble some of the leading reports offered by U.S. carriers. An integrated management reporting package will not be available in the service's initial phase, but product managers said this is something they are working on.

Stentor will use the Canadian telephone company billing systems to invoice accounts, but customers will have the option to have different reports sent to different levels in a hierarchy, such as a department or division. Stentor can arrange to have all the reporting on a single bill.

AT&T-Unitel will face many of the same practical problems as MCI-Stentor. At this time, it is impossible to say exactly how far Unitel is going to go with the concept of integrating the AT&T and Unitel platforms.

Offering single billing and consolidated network management is part of AT&T's stated objectives with Unitel. "For us, it's when, not if, we will offer these services," Unitel's MacDonald said. These capabilities are expected to steadily roll out during the beta-testing cycle and be ready when the services are generally available, he said.

Unitel will maintain three separate billing processes for virtual network service in Canada: one for the existing VRoute service, one for the new VRoute II and one for the new AT&T SDN Canada product. Some underlying components of these processes will be the same, such as some interfaces to the customer account provisioning database.

According to product managers at Unitel, the carrier has contracted with a party of "considerable experience with SDN billing" — likely AT&T itself — who will offer single, integrated, consolidated billing packages for the VRoute II offering. As for the AT&T-Unitel SDN Canada offering, Unitel will be adapting several internal processes and working with AT&T to offer integrated billing and reporting.

"We will offer one bill, one set of management reports and one view of the AT&T-Unitel offering from Day One of general availability," MacDonald said.

Virtual net management

One area in which MCI has excelled in the U.S. has been network management. MCI has functional offerings on a service level

basis, such as Vnet's Configuration Manager (CM), which is used to maintain features and dialing plans for Vnet, as well as integrated offerings that cross services.

The initial rollout of the MCI-Stentor service will not include customer network management capabilities that would reside at the customer site. Stentor account teams are expected to have access to CM for account maintenance, but Stentor executives want to wait for the MCI net management products to be "Canadianized" to reflect the needs of the customers in Canada.

"MCI's systems have to be modified so that they read in French, for instance, and specifically relate to the Advantage Vnet offering," Stentor's Campbell said. He expects to see this revised CM system before the end of the year.

Unitel managers said they expect to offer the bulk of AT&T's

MacDonald said Unitel is working with AT&T to quickly merge reporting streams.

▲▲▲

element level management capabilities in Phase 1 of AT&T SDN Canada. AT&T has multiple element-level network management capabilities for everything from authorization code maintenance to access-line monitoring.

MacDonald also said Unitel is working with AT&T to quickly merge reporting streams.

"We hope to make Canadian SDN traffic available to AT&T's On-Line Call Detail Data (OCDD) network management element system at the same time as the U.S. traffic so that customers can manage their networks like one," he said.

The AT&T OCDD-Real Time product is the linchpin of AT&T's NetProtect fraud monitoring capability.

In practice, though, it remains to be seen exactly which of these AT&T network management systems Unitel makes available in the early phases. The packages are complicated to learn, even for support groups, and in the end it will depend largely on how much Unitel can fit into the initial offering without overloading the employees involved on the project.

Pricing

The pricing environment in Canada will be different for many

U.S. managers. For instance, custom pricing plans are illegal in Canada; this will limit any movement toward combined Canadian-U.S. pricing and umbrella-like discounting plans.

MCI and Stentor will have separate pricing schemes. The Advantage Vnet usage is rolled up on a national level for discounting purposes. It is not priced on a provincial basis as services in the past have been. Access pricing is flat rate, not mileage-sensitive, eliminating the backhaul to the three Advantage Vnet switches as an issue.

Unitel's pricing also will be separate from AT&T's. Unitel will use its existing VRoute tariffs to support the new service. Unitel's services are subject to some calling restrictions in the prairie provinces of Alberta, Manitoba, and Saskatchewan, which prohibits calling from on-net to off-net locations within those provinces. Stentor does not have this limitation with Advantage Vnet.

Alberta and Manitoba are expected to get rid of these restrictions by the end of 1993, according to Unitel.

Looking ahead

The next step for both entities is to expand beyond virtual network services. Both MCI-Stentor and AT&T-Unitel have already announced seamless international frame relay service in Canada.

AT&T, when it announced the Unitel agreement, said that by mid-1993, AT&T and Unitel would offer "virtual network service for voice and data communications on the public network; packet and frame relay data services on the public network; digital private-line service for high-speed data and voice communications between Canada and the U.S. or between two points within Canada; and enhanced audio teleconferencing services." All of that is on track at this point. MCI-Stentor plan other announcements, too.

For Canadian customers, the telecommunications world has taken a huge step forward. The key is being patient and not biting off more than one can chew. Like buying a private branch exchange, the 1,000 or so features are not what is important; only the six or seven commonly used features are. ■

Briere is president of TeleChoice, Inc., a Verona, N.J., consultancy specializing in strategic planning and analysis of intelligent networks, services and applications. He can be reached at (201) 239-0700.

Interested in more information on Canadian VPNs? TeleChoice has just issued a white paper on the topic. For details, call the number above.

Getting directory assistance

continued from page 41

To simplify routing and improve performance, Banyan recommends placing all ENS for NetWare servers on the backbone network and minimizing the number of routers between them.

ENS for NetWare has a facility called MTRUSTEE that enables administrators to examine NetWare file and directory attributes from the ENS for NetWare console.

But MTRUSTEE currently does not enable administrators to change NetWare file and directory attributes. The stated workaround is to use the standard NetWare utility, FILER.

This is unfortunately the case with many other aspects of network management. Where ENS for NetWare does not support some feature of NetWare — for instance, adding and configuring printers to NetWare servers — a combination of ENS for NetWare and NetWare utilities must be used.

There are many cases, however, when using NetWare utilities instead of the appropriate ENS for NetWare facilities can lead to inconsistency or undesirable behavior.

For instance, testing found that ENS for NetWare's MUSER utility was the best way to add to the StreetTalk database new names that represent NetWare volume, printer and print queue names created on NetWare servers after the STI culled all the bindery information.

If those names were instead put in the bindery, they would be invisible to StreetTalk and might conflict with names used on other servers.

Summary

ENS for NetWare is an extremely powerful product that can simplify the view of a Net-

Ware network. But like most powerful tools, it should be used carefully.

There are numerous important notes throughout its documentation that essentially warn network managers that the software does not keep them from making mistakes during configuration or using it in illogical ways. Only a careful review of the documentation will help network managers avoid mistakes.

The simplicity and power of StreetTalk needs to be balanced against the additional complexity of supporting multiple server types and network protocols.

Network managers who have spent years figuring out how to administer NetWare networks will need to learn another set of concepts and utilities.

Upgrading to NetWare 4.0 will not be trivial either since many of the same concepts must be learned and NetWare 4.0 contains a number of new utilities that replace or integrate the functions of those in previous NetWare releases.

Network managers looking for ways to provide a simpler, more unified view of the network — both for their users and for day-to-day management procedures — should seriously consider implementing a global naming scheme such as those provided by ENS for NetWare and NetWare 4.0. ■

Brown is the managing editor of features at Network World, and Mattin is chief engineer at Focus Software, Inc.

Testing was conducted at Focus Software, Inc.'s Salem, N.H.-based laboratory. Focus Software provides network software testing and consulting services to end users and vendors. The company can be reached at (603) 890-1000.

Letters

continued from page 33

nopoly control of "bottleneck" facilities, possess the incentive and opportunity to use their market power to impede competition. These dangers persist.

Pearce says Judge Greene's major reason for continuing the restrictions is that "he never believed that the [Federal Communications Commission], under Reagan-Bush leadership, had the commitment to regulate the RBHCs effectively." Again, this misstates the record. Judge Greene found that "the FCC is not now and never has been capable of effectively regulating the Bell [companies]." That conclusion was based on testimony from FCC

officials who served before the Reagan-Bush era.

Pearce also claims that the RBHCs "now compete vigorously" with one another. "Collude" might be a more accurate description. They coordinate standards-setting through Bell Communications Research and jointly sponsor massive campaigns to manipulate public opinion and influence Congress.

Pearce was way off base with his irreverent criticism of one of our nation's most respected jurists. He did get one thing right: the MFJ is a "resounding success." Let's keep it that way.

James Casserly
Attorney

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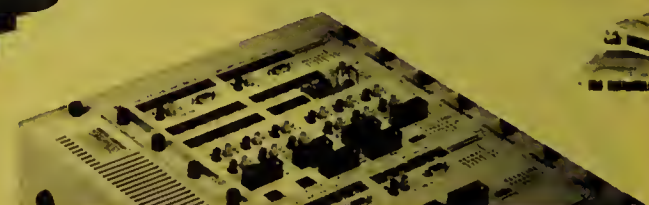
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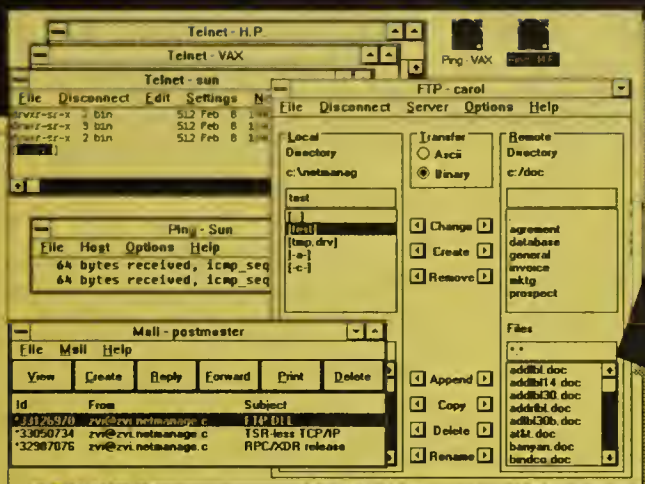
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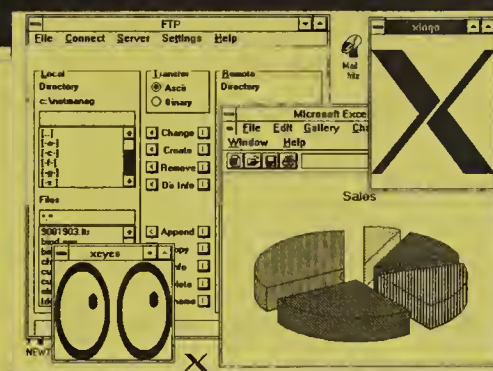
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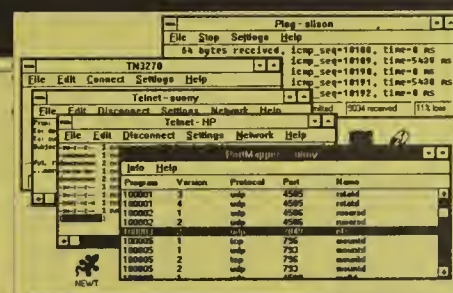
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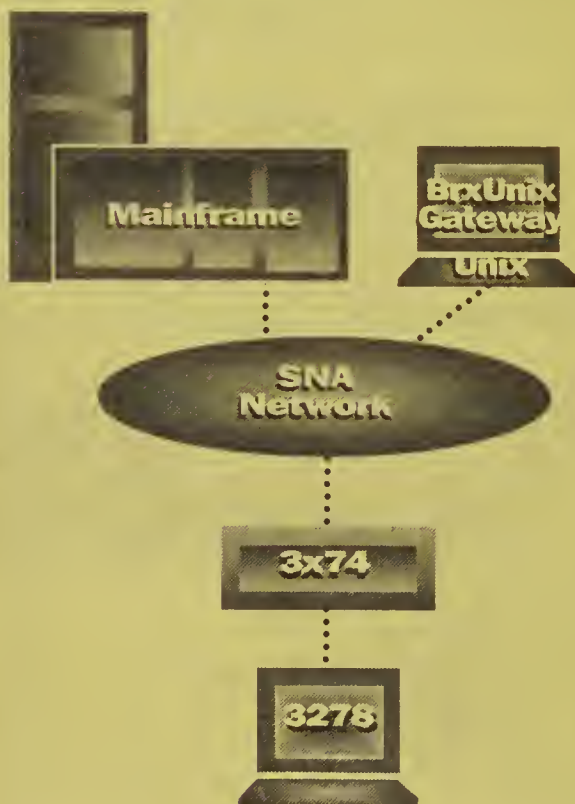
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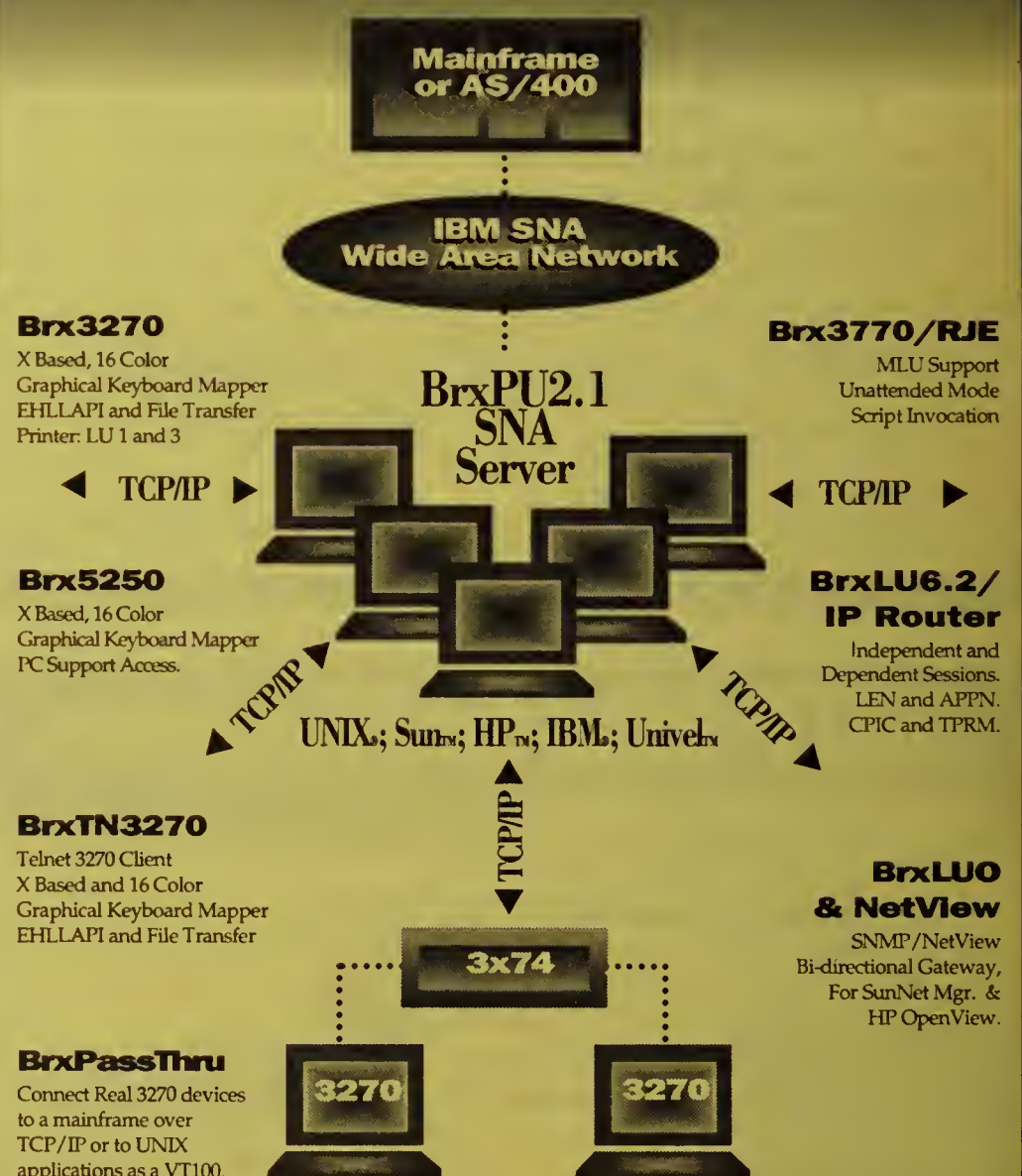
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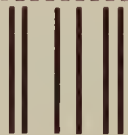
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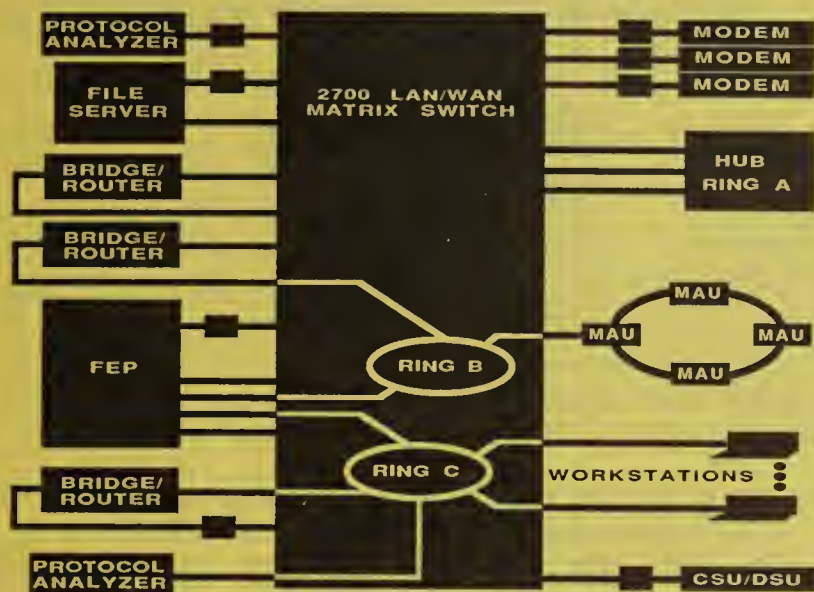
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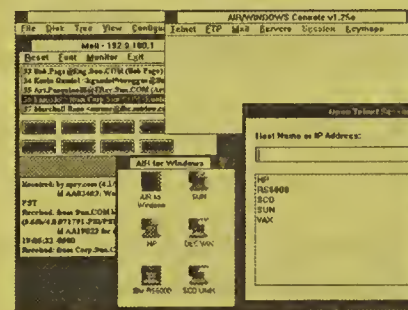
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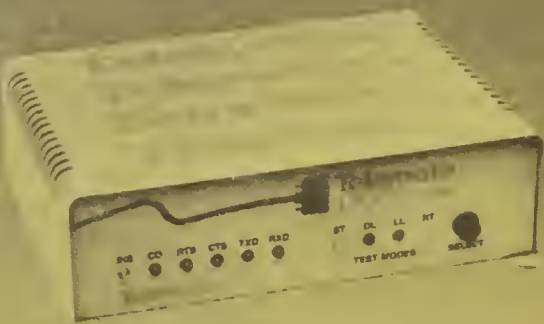
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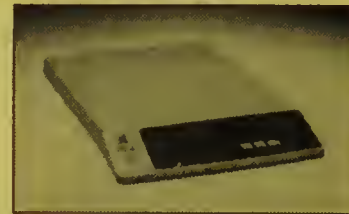
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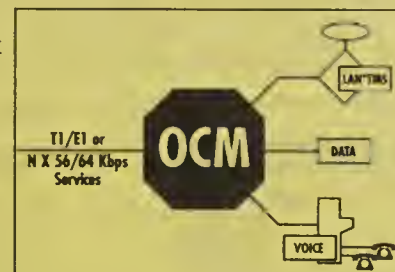


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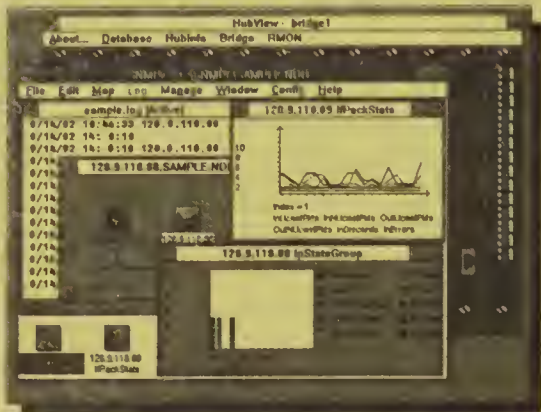
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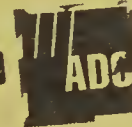


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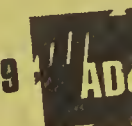
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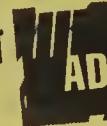
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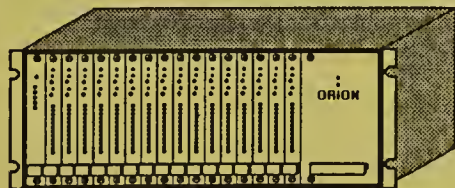
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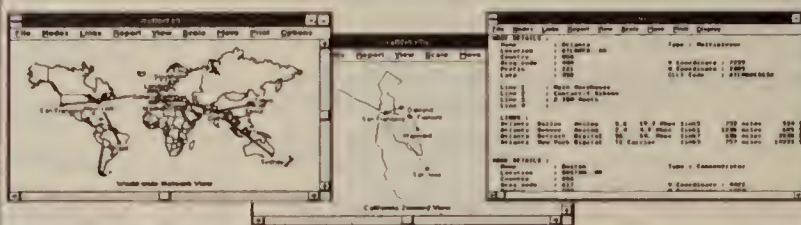
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May 7.....Chicago, IL
May 10.....Los Angeles, CA
May 11.....San Francisco, CA
May 12.....Seattle, WA
May 21.....Washington, DC
June 2.....Dallas, TX
June 3.....Atlanta, GA
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September 13.....Denver, CO
September 14.....Dallas, TX
September 27.....Boston, MA
September 28.....New York, NY
September 29.....Washington, DC
October 13.....Los Angeles, CA
October 14.....San Francisco, CA
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October 21.....Orlando, FL
November 16.....Minneapolis, MN
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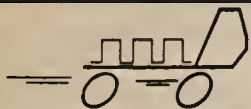
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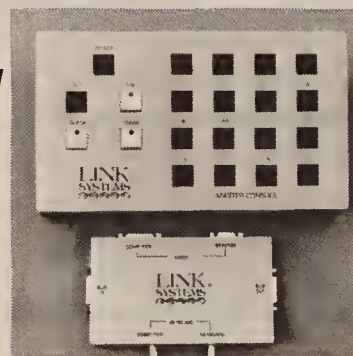
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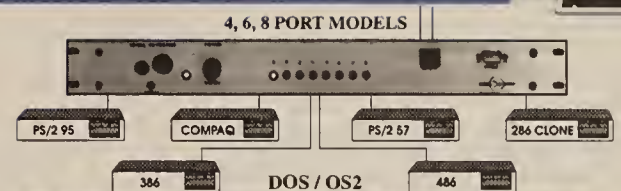
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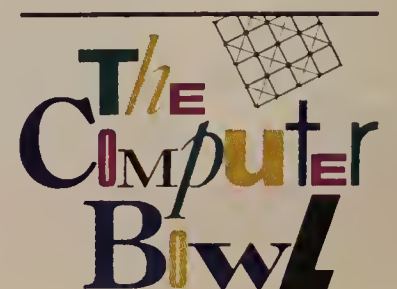


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MoNet paints rosy picture

continued from page 1
plifying billing.

This summer, Motorola will begin licensing MoNet — which includes a developers' tool kit and an application program interface (API) — to makers of mobile computing gear, software developers and service providers in hopes of establishing it as an integration standard.

MoNet will be implemented in Motorola's own line of modems and supported by the ARDIS Co. mobile data service, a Motorola joint venture with IBM.

A dozen companies, including BT North America, Inc., RAM Mobile Data, Inc. and Tandem Computers, Inc., have endorsed MoNet as an approach to uniting the fractious wireless data marketplace.

Several firms that have caught a glimpse of MoNet expect to license the technology when it is available.

BT North America is considering MoNet for use in its global network, said Raja Rajaraman, BT North America's vice president of applications technology. Rajaraman said BT customers have embraced mobile computing, but



PHOTO © 1993 STEVEN BORNES
Growney

the lack of a common access and transport standard has forced BT to implement separate gateways to its global net for each wireless service.

ARDIS rival RAM Mobile Data is currently evaluating the technology as a means of ending fragmentation within the wireless industry. "We are interested in this, and we will have discussions," said Ed Sharp, executive vice president at RAM.

Motorola created MoNet because of the lack of standards for wireless communications, said Les Schroyer, corporate vice president and director of network products at Motorola's paging wireless data group.

"We're not just shopping an API around," Schroyer said. "We made a multimillion-dollar investment in software we intend to make available on favorable terms."

MoNet is designed to work as a gateway that handles message routing and delivery, said Robert Growney, executive vice president of Motorola and general manager of the paging and wireless data group.

MoNet also supports X.500 directory services and a uniform means for billing.

MoNet will support services in place today, as

well as new services such as Cellular Digital Packet Data (see story, page 27).

William Davies, Motorola wireless data group vice president and director of business development, said he hopes vendors will build MoNet support into their products.

MoNet software will support an "instant sign-up" feature that lets users key in an over-the-air sign-up application, obtain a personal identification and automatically connect to any service. The end user would have the option of receiving a single bill from one of the service providers supporting MoNet.

Richard Miller, vice president of communications technologies at General Magic, Inc. — the Mountain View, Calif.-based startup now developing key software for wireless computing in its Telescript and Magic Cap products — endorsed MoNet, calling Motorola's effort complementary.

"The General Magic and Motorola APIs will have to be able to work together — and they will," Miller emphasized.

Roberta Wiggins, associate director for wireless/mobile communications at the Boston-based consultancy The Yankee Group, said MoNet "addresses a real problem in the wireless market — the lack of interoperability."

While calling the Motorola effort to unite the wireless and wireline worlds "a lofty ideal," Wiggins nevertheless gave it a fair chance of success. □

to use Enterprise/Access to support client/server applications in 40 departments.

According to Richardson, Enterprise/Access can improve application performance because it can issue concurrent requests to back-end services. Most client tools, such as Powersoft Corp.'s PowerBuilder, can issue only one request at a time. This cuts response times, especially when users request information scattered across multiple databases.

Enterprise/Access runs on Unix servers from Hewlett-Packard Co., Pyramid Technology Corp. and Sun Microsystems, Inc., and supports a variety of communications protocols, including LU 6.2, the Transmission Control Protocol/Internet Protocol, Telnet and Binary Synchronous Communications as well as asynchronous protocols.

Client applications can access Enterprise/Access via Apertus' proprietary application program interface (API) or Sybase, Inc.'s Open Client interface via remote procedure calls.

Enterprise/Access comes with a tool kit that contains a high-level object scripting language for

building interface services that control communications and the sequence in which messages are delivered.

Developers can also use C language and, in later releases, C++, to build interfaces.

Enterprise/Access is one of the few middleware tools that provides systems management capabilities. The product's Enterprise Monitor facility offers performance, fault and configuration management information. The product's management agent, which Apertus is making openly available, will also support the Simple Network Management Protocol later this year.

Pricing for Enterprise/Access depends on the server size. The tool kit costs between \$25,000 and \$120,000, and a run-time license, which includes systems management tools, is priced between \$20,000 and \$90,000.

Client libraries, or client-side APIs, cost between \$150 and \$15,000 per platform, while the Enterprise/Access Open Server Gateway costs between \$2,000 and \$70,000. □

Apertus: (612) 828-0300.

Forms work flow gains momentum

continued from page 2

WordPerfect's InForms, for example, provides high-level query and data entry capabilities because it incorporates Q+E Software, Inc.'s Q+E Database Editor, which provides access to multiple databases, according to Ronni Marshak, a work group computing analyst at the Patricia Seybold Group, Inc. in Boston.

Microsoft's Electronic Forms Designer (E-Forms) package offers tight integration with Microsoft Mail, allowing users to conduct intelligent routing.

Other players offering sophisticated routing capabilities include JetForm Corp. of Ottawa and Beyond, Inc., which supports rules-based forms routing within its BeyondMail E-mail system.

One company promising both intelligent forms routing with easy access to multiple databases is Delrina, which this week will announce Delrina FormFlow, a work flow edition of its forms design software called PerForms.

FormFlow ties into most E-mail systems' standard messaging interfaces, including the Vendor Independent Messaging (VIM) interface, Microsoft's Messaging Application Programming Interface and Novell's Message Handling Service (MHS) interface. But Delrina FormFlow also links directly to desktop and SQL databases, such as Borland International, Inc.'s dBase and Paradox, IBM's DB2 and OS/2 Database Manager, Microsoft's SQLServer and Oracle Corp.'s Oracle Server.

In addition, Delrina offers a scripting language similar to BASIC that enables developers to build routing or distribution lists and business rules and procedures that govern the movement of forms or data throughout an organization. Besides supporting generic forms routing, the script-

ing language lets developers build complex work flows for routing information in claims processing and inventory/shipping applications.

"Delrina has done a good job of establishing hooks into E-mail and databases," said Judy Rosall, manager of the Electronic Messaging Sector at International Data Corp. in Framingham, Mass.

Delrina, Microsoft and WordPerfect will ship products in June. Users who purchase Delrina FormFlow will pay \$399 for a design module and \$1,840 for a 10-user application pack.

Microsoft's E-Forms will cost

“Delrina has done a good job of establishing hooks into E-mail and databases.”

▲▲▲

\$395 with no run-time licenses. E-Forms uses Microsoft's Visual Basic to develop Windows-based work flow applications and Microsoft Mail to route data and forms (NW, April 12, page 35).

WordPerfect will ship the designer portion of InForms in June for \$495 and the user portion soon after for \$199 per user, with discounts for multiple users. WordPerfect plans to make InForms available on DOS and Windows this year, and Unix, Macintosh and OS/2 workstations in 1994. In contrast, Delrina's FormFlow and Microsoft's E-Forms support only Windows applications, although Microsoft is reportedly developing DOS and Macintosh versions. □

Delrina: (416) 441-3676;
Microsoft: (206) 882-8080;
WordPerfect: (801) 225-5000.

Databases to get object capabilities

continued from page 4

store [software] that is easy to write applications for and that you can plug into a server." The software will give remote users dial-up access to databases and electronic mail services.

Team efforts

In a related matter, Oracle and US West, Inc. next week plan to announce a joint venture designed to provide a collection of interactive information services to businesses and consumers.

Oracle has additionally embarked on an effort to test similar services with McCaw Cellular Communications, Inc. Both ef-

forts are part of the broad strategy Oracle has outlined for becoming involved in such efforts (NW, Feb. 1, page 1).

While Oracle and US West officials declined to provide details, sources said Oracle will provide database software designed to run on massively parallel computers at US West, which will develop applications such as electronic yellow pages and multimedia offerings.

Oracle is said to be interested in marketing such database-oriented services to other carriers, while US West is expected to market its applications to other carriers, as well.

Senior Editor Bob Brown contributed to this story.

REASON #1

No More And T

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800
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Pending tariff effectiveness. The Never Miss A Call Guarantee is based on customer installing at least one of the specified reliability features. If an 800 call is ever missed, AT&T will refund the monthly service charge. **Free installation is for features only. Must be installed by December 15, 1993. Customer must keep AT&T MEGACOM 800 Service and installed feature(s) for six months or they will be billed for the waived charges. Other conditions apply.

A surreal landscape with a person standing on a large, fluffy cloud. A long, dark ladder extends from the bottom of the frame up to the person. The sky is filled with layers of clouds, and a bright sun is visible at the top, creating a warm, orange glow. The overall scene suggests reaching a distant or elevated position.

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Our Networks Mean Business

Cast your vote today in our Enterprise Technology Awards!



Dear *Network World* Reader:

Today, you're building the enterprise networks that support a new generation of client/server and distributed applications — applications that can give your organization a competitive edge in a tight marketplace.

Network World's second annual Enterprise Technology Awards program offers you the chance to recognize your strategic partners — the vendors delivering the interoperable products and services that support your enterprise network.

Attached to this week's issue is an easy-to-complete survey form listing a variety of product and service categories. In each category, simply select the one vendor whose products you think are the most interoperable — those that work best in a multivendor enterprise network environment.

If you are missing an entry form, please call us at (800) 622-1108 for more information. All entries must be submitted by June 7, 1993.

The winners of the 1993 Enterprise Technology Awards will be featured in a special issue of *Network World*, and the awards will be presented at INTEROP in August.

Unlike other publications, *Network World* relies on the real experts — users — to choose the outstanding suppliers of network products and services. Don't miss this opportunity to cast your vote!

Thanks,

A handwritten signature in cursive script, appearing to read "John Gallant".

John Gallant
Editor

NETWORK WORLD

The Meadows, 161 Worcester Road, Framingham, MA 01701-9172, (508) 875-6400
An IDG Company: The World's Leader In Information Services Technology.

A surreal landscape with a person standing on a cloud, looking up at a sun partially obscured by clouds. A ladder is positioned diagonally across the scene, reaching from the bottom towards the sun. The overall color palette is warm, with oranges, yellows, and browns.

**Having the only
integrated network
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tends to distance you
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Our Networks Mean Business

Vote today in Network World's 1993 Enterprise Technology Awards

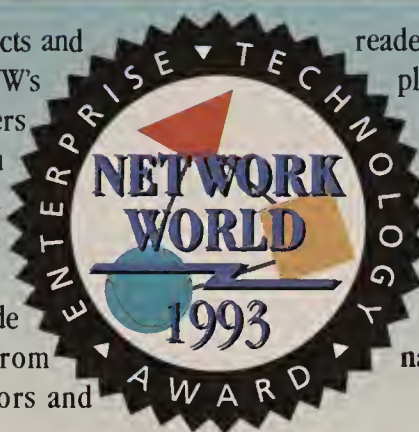
Each week, Network World brings you news and views on the products and services shaping enterprise networks. Now it's your turn to speak out. NW's Enterprise Technology Awards give you the chance to spotlight suppliers whose products work best in a multi-vendor network environment. You approve and purchase these products. You have to implement and manage them. We want your votes on which vendors deserve to be recognized for their enterprise solutions.

The survey form below lists major suppliers of local area network, wide area network and software products based on market research from International Data Corp., as well as input from NW staff, contributors and

readers. A space marked "Other" is available for write-ins. In each category, please select the ONE vendor whose product you feel is most interoperable, or best designed to work in an enterprise network environment. The winners will be honored at a special ceremony at INTEROP in August.

This form is a prepaid mailer that can be returned at no expense to you. You may also fax the form (both sides please!) to NW at (508) 820-3467. **ALL ENTRIES MUST BE RECEIVED BY JUNE 7, 1993.**

No entry will be accepted without your name and company name. Entries from participating vendors will be disqualified.



PLEASE VOTE FOR ONLY ONE SUPPLIER IN EACH CATEGORY.

1. Adapters

- A. Ethernet
- ☐ Accton Technology Corp. 05
 - ☐ Artisoft, Inc.
 - ☐ Asante Technologies, Inc.
 - ☐ Cabletron Systems, Inc.
 - ☐ Digital Communications Associates, Inc.
 - ☐ Digital Equipment Corp.
 - ☐ D-Link Systems, Inc.
 - ☐ Eagle Technology
 - ☐ Gateway Communications, Inc.
 - ☐ Hayes Microcomputer Products, Inc.
 - ☐ IBM
 - ☐ Intel Corp.
 - ☐ NetWorth, Inc. 06
 - ☐ Racal-Datcom, Inc.
 - ☐ Standard Microsystems Corp.
 - ☐ Thomas-Conrad Corp.
 - ☐ 3Com Corp.
 - ☐ Tiara Computer Systems, Inc.
 - ☐ Other 07

B. Token Ring

- ☐ Andrew Corp. 08
- ☐ Asante Technologies, Inc.
- ☐ Digital Communications Associates, Inc.
- ☐ Eagle Technology
- ☐ IBM
- ☐ Madge Networks, Inc.
- ☐ Networth, Inc.
- ☐ Olicom USA, Inc.
- ☐ Optical Data Systems, Inc.
- ☐ Proteon, Inc.
- ☐ Racal-Datcom, Inc.
- ☐ Standard Microsystems Corp.
- ☐ Thomas-Conrad Corp. 09
- ☐ 3Com Corp.
- ☐ Other 10

C. FDDI

- ☐ Cabletron Systems, Inc. 11
- ☐ Codenoll Technology Corp.
- ☐ Crescendo Communications, Inc.
- ☐ Digital Equipment Corp.
- ☐ Fibronics International, Inc.
- ☐ IBM
- ☐ Interphase Corp.
- ☐ Network Peripherals, Inc.
- ☐ Network Systems Corp.
- ☐ SBE, Inc.
- ☐ Silicon Graphics, Inc.
- ☐ Summit Microsystems Corp.
- ☐ SysKonnect, Inc. 12
- ☐ 3Com Corp.
- ☐ Other 13

2. Bridges

- ☐ Advanced Computer Communications 14
- ☐ Andrew Corp.
- ☐ Cabletron Systems, Inc.
- ☐ CrossComm Corp.
- ☐ Digital Equipment Corp.
- ☐ Hewlett-Packard Co.
- ☐ IBM
- ☐ Magnalink Communications Corp.
- ☐ Microcom, Inc.
- ☐ Netronix, Inc.
- ☐ Network Systems Corp.

- ☐ Newbridge Networks, Inc. 15
- ☐ Olicom USA, Inc.
- ☐ RAD Data Communications
- ☐ RAD Network Devices Inc.
- ☐ Retix
- ☐ 3Com Corp.
- ☐ Ungermann-Bass, Inc.
- ☐ Other 16

3. Routers

- ☐ Advanced Computer Communications 17
- ☐ Alantec
- ☐ Ascom Timeplex, Inc.
- ☐ Cisco Systems, Inc.
- ☐ Coral Network Corp.
- ☐ CrossComm Corp.
- ☐ Digital Equipment Corp.
- ☐ IBM
- ☐ Novell, Inc.
- ☐ Proteon, Inc.
- ☐ RAD Network Devices, Inc.
- ☐ Retix
- ☐ 3Com Corp. 18
- ☐ Network Systems Corp.
- ☐ Wellfleet Communications, Inc.
- ☐ Other 19

4. Intelligent Hubs

- ☐ Artel Communications Corp. 20
- ☐ Asante Technologies, Inc.
- ☐ Ascom Timeplex, Inc.
- ☐ Bytex Corp.
- ☐ Cabletron Systems, Inc.
- ☐ Chipcom Corp.
- ☐ David Systems, Inc.
- ☐ Fibronics International, Inc.
- ☐ Fibermux Corp.
- ☐ Gandalf Systems Corp.
- ☐ Hewlett-Packard Co.
- ☐ Hughes LAN Systems, Inc.
- ☐ IANNET Data Communications, Inc. 21
- ☐ NCR Corp.
- ☐ NetWorth, Inc.
- ☐ Racal-Datcom, Inc.
- ☐ Optical Data Systems, Inc.
- ☐ Plexcom, Inc.
- ☐ Proteon, Inc.
- ☐ SynOptics Communications, Inc.
- ☐ 3Com Corp.
- ☐ Ungermann-Bass, Inc.
- ☐ Other 22

5. LAN Diagnostic/Management Tools

- ☐ BICC Data Networks, Inc./3Com Corp. 23
- ☐ Data General Corp.
- ☐ Digilog, Inc.
- ☐ FTP Software, Inc.
- ☐ Hewlett-Packard Co.
- ☐ IBM
- ☐ Network General Corp.
- ☐ NetWorth, Inc.
- ☐ Novell, Inc.
- ☐ Spider Systems, Inc.
- ☐ Other 24

6. LAN Servers

- ☐ Advanced Logic Research, Inc. 25
- ☐ AST Research, Inc.

- ☐ Compaq Computer Corp. 26
- ☐ CompuAdd Corp.
- ☐ Dell Computer Corp.
- ☐ Digital Equipment Corp.
- ☐ Everex Systems, Inc.
- ☐ Hewlett-Packard Co.
- ☐ IBM
- ☐ Network Connections, Inc.
- ☐ Northgate Computer Corp.
- ☐ Other 27

7. Superservers

- ☐ Advanced Logic Research, Inc. 28
- ☐ Acer, Inc.
- ☐ Altos Computer Systems
- ☐ Auspex Systems, Inc.
- ☐ Compaq Computer Corp.
- ☐ Digital Equipment Corp.
- ☐ Epoch Systems, Inc.
- ☐ IBM
- ☐ NCR Corp.
- ☐ NetFRAME Systems, Inc.
- ☐ Parallax Computer, Inc.
- ☐ Tricord Systems, Inc.
- ☐ Unisys Corp. 29
- ☐ Other 30

8. Network Operating Systems

- ☐ Banyan Systems, Inc. 31
- ☐ Digital Equipment Corp.
- ☐ IBM
- ☐ Microsoft Corp.
- ☐ Novell, Inc.
- ☐ Other 32

9. Peer-to-Peer Networks

- ☐ Apple Computer, Inc. 33
- ☐ Artisoft, Inc.
- ☐ Gateway Communications, Inc.
- ☐ Hayes Microcomputer Products, Inc.
- ☐ Invisible Software, Inc.
- ☐ Microsoft Corp.
- ☐ Novell, Inc.
- ☐ Sitka Corp.
- ☐ Tiara Computer Systems, Inc.
- ☐ Webcorp
- ☐ Other 34

10. Wireless LANs

- ☐ AT Schindler 35
- ☐ BICC Communications
- ☐ Caliber Tek, Inc.
- ☐ California Microwave
- ☐ INFRALINK of America, Inc.
- ☐ Motorola, Inc.
- ☐ NCR Corp.
- ☐ O'Neill Communications, Inc.
- ☐ Photonics Corp.
- ☐ Proxim, Inc.
- ☐ Telesystems SLW, Inc.
- ☐ Windata, Inc. 36
- ☐ Other

11. Apple Connectivity Products

- ☐ Asante Technologies, Inc. 37
- ☐ Alisa Systems, Inc.
- ☐ Apple Computer, Inc.
- ☐ Cayman Systems, Inc.
- ☐ Compatible Systems, Inc.
- ☐ Digital Equipment Corp.
- ☐ Farallon Computing, Inc.
- ☐ Novell, Inc.
- ☐ Pacer Software, Inc.
- ☐ Shiva Corp.
- ☐ Sitka Corp.
- ☐ Webster Computer Corp.
- ☐ Other 38

12. Imaging Systems

- ☐ Digital Equipment Corp. 39
- ☐ FileNet Corp.

- ☐ IBM 40
- ☐ Imagery Software, Inc.
- ☐ Formtek, Inc.
- ☐ Imnet, Inc.
- ☐ Indus, Int'l
- ☐ Optika Imaging Systems, Inc.
- ☐ Plexus Computers, Inc.
- ☐ Wang Laboratories, Inc.
- ☐ Sigma Systems, Inc.
- ☐ View Star Corp.
- ☐ Other 41

13. Data Base Management Systems

- ☐ Borland International, Inc. 42
- ☐ Cincom systems, Inc.
- ☐ Computer Associates International, Inc.
- ☐ Computer Corp. of America
- ☐ Digital Equipment Corp.
- ☐ Gupta Technologies, Inc.
- ☐ Hewlett-Packard Co.
- ☐ IBM
- ☐ Information Builders, Inc.
- ☐ Informix Software, Inc.
- ☐ Ingres Corp.
- ☐ Micro Data Base Systems, Inc.
- ☐ Microsoft Corp. 43
- ☐ Novell, Inc.
- ☐ Oracle Corp.
- ☐ Progress Software Corp.
- ☐ Revelation Technologies, Inc.
- ☐ Software AG
- ☐ Sybase, Inc.
- ☐ Unify Corp.
- ☐ XDB Systems, Inc.
- ☐ Other 44

14. E-Mail Software

- ☐ Banyan Systems, Inc. 45
- ☐ Beyond, Inc.
- ☐ CE Software, Inc.
- ☐ Data General Corp.
- ☐ DaVinci Systems Corp.
- ☐ Digital Equipment Corp.
- ☐ Enable Software
- ☐ Futurus Corp.
- ☐ Hewlett-Packard Co.
- ☐ IBM
- ☐ Lotus Development Corp./cc:Mail
- ☐ Microsoft Corp.
- ☐ Notework Corp. 46
- ☐ Reach Software Corp.
- ☐ Other 47

15. E-Mail Switches

- ☐ AAC Associates 48
- ☐ Alisa Systems, Inc.
- ☐ Digital Equipment Corp.
- ☐ Hewlett-Packard Co.
- ☐ Isocor
- ☐ NCR Corp.
- ☐ Novell, Inc.
- ☐ OSIWare, Inc.
- ☐ Retix
- ☐ Soft-Switch, Inc.
- ☐ Technology Development Systems, Inc.
- ☐ The Boston Software Works, Inc.
- ☐ Wingra Technologies, Inc. 49
- ☐ Worldtalk, Corp.
- ☐ Other 50

16. Group Collaboration Software

- ☐ Collaborative Technologies Corp. 51
- ☐ Computer Associates International, Inc.
- ☐ Coordination Technology, Inc.
- ☐ Enable Software
- ☐ Group Technologies, Inc.
- ☐ Lotus Development Corp.
- ☐ Microsoft Corp.
- ☐ NCR Corp.
- ☐ ON Technology, Inc.
- ☐ Reach Software Corp.

1 <input type="checkbox"/> Ventana Corp.	52
2 <input type="checkbox"/> Other _____	53
17. Client/Server Applications Development Tools	
1 <input type="checkbox"/> Blyth Software, Inc.	54
2 <input type="checkbox"/> Cadre Technologies, Inc.	
3 <input type="checkbox"/> Cognos Corp.	
4 <input type="checkbox"/> Gupta Corp.	
5 <input type="checkbox"/> IBM	
6 <input type="checkbox"/> Inference Corp.	
7 <input type="checkbox"/> Informix Software, Inc.	
8 <input type="checkbox"/> Ingres Corp.	
9 <input type="checkbox"/> Matesys Corp.	
0 <input type="checkbox"/> Object Systems	
x <input type="checkbox"/> Oracle Corp.	
y <input type="checkbox"/> Spinnaker Software Corp.	
1 <input type="checkbox"/> Powersoft Corp.	55
2 <input type="checkbox"/> Progress Software Corp.	
3 <input type="checkbox"/> Seer Technologies, Inc.	
4 <input type="checkbox"/> Sybase, Inc.	
5 <input type="checkbox"/> Texas Instruments, Inc.	
6 <input type="checkbox"/> Uniface Corp.	
7 <input type="checkbox"/> Visix Software, Inc.	
8 <input type="checkbox"/> Other _____	56
18. Middleware	
1 <input type="checkbox"/> Covia Technologies, Inc.	57
2 <input type="checkbox"/> Creative Systems Interface, Inc.	
3 <input type="checkbox"/> Digital Equipment Corp.	
4 <input type="checkbox"/> Hewlett-Packard Co.	
5 <input type="checkbox"/> Horizon Strategies, Inc.	
6 <input type="checkbox"/> Hyperdesk Corp.	
7 <input type="checkbox"/> IBM	

1 <input type="checkbox"/> Momentum Software Corp.	58
2 <input type="checkbox"/> NCR Corp.	
3 <input type="checkbox"/> PeerLogic, Inc.	
4 <input type="checkbox"/> Sun Microsystems, Inc.	
5 <input type="checkbox"/> Symiotics, Inc.	
6 <input type="checkbox"/> Systems Strategies, Inc.	
7 <input type="checkbox"/> Tivoli Systems, Inc.	
8 <input type="checkbox"/> Other _____	59
19. Integrated Network Management Systems	
1 <input type="checkbox"/> Applied Computing Devices, Inc.	60
2 <input type="checkbox"/> Boole & Babbage, Inc.	
3 <input type="checkbox"/> Bell Northern Research	
4 <input type="checkbox"/> BT	
5 <input type="checkbox"/> Cahletron Systems, Inc.	
6 <input type="checkbox"/> Digital Equipment Corp.	
7 <input type="checkbox"/> Hewlett-Packard Co.	
8 <input type="checkbox"/> IBM	
9 <input type="checkbox"/> MAXM Systems Corp.	
0 <input type="checkbox"/> MCI Communications Corp.	
x <input type="checkbox"/> NCR Corp.	
y <input type="checkbox"/> Nynex	
1 <input type="checkbox"/> Sprint Corp.	61
2 <input type="checkbox"/> SunConnect	
3 <input type="checkbox"/> Systems Center	
4 <input type="checkbox"/> WilTel	
5 <input type="checkbox"/> Other _____	62
20. DSU/CSU	
1 <input type="checkbox"/> ADC Kentrox	63
2 <input type="checkbox"/> AT&T Paradyne	
3 <input type="checkbox"/> Data Race, Inc.	
4 <input type="checkbox"/> Digital Access Corp.	

1 <input type="checkbox"/> Digital Link Corp.	64
2 <input type="checkbox"/> Dowty Communications, Inc.	
3 <input type="checkbox"/> General DataComm, Inc.	
4 <input type="checkbox"/> Larse Corp.	
5 <input type="checkbox"/> Motorola Codex	
6 <input type="checkbox"/> Penril DataComm Networks	
7 <input type="checkbox"/> Racal-Datcom, Inc.	
8 <input type="checkbox"/> UDS Motorola	
9 <input type="checkbox"/> Verilink Corp.	
0 <input type="checkbox"/> Other _____	65
21. High-Speed Modems (9.6K & above)	
1 <input type="checkbox"/> AT&T Paradyne	66
2 <input type="checkbox"/> Canoga-Perkins	
3 <input type="checkbox"/> General DataComm, Inc.	
4 <input type="checkbox"/> Hayes Microcomputer Products, Inc.	
5 <input type="checkbox"/> Microcom, Inc.	
6 <input type="checkbox"/> Motorola Codex	
7 <input type="checkbox"/> Multi-Tech Systems, Inc.	
8 <input type="checkbox"/> Octocom Systems, Inc.	
9 <input type="checkbox"/> Practical Peripherals, Inc.	
0 <input type="checkbox"/> Racal-Datcom, Inc.	
1 <input type="checkbox"/> Telebit Corp.	67
2 <input type="checkbox"/> UDS Motorola	
3 <input type="checkbox"/> US Robotics, Inc.	
4 <input type="checkbox"/> Other _____	68
22. Communications Software	
1 <input type="checkbox"/> Datastorm Technologies, Inc.	69
2 <input type="checkbox"/> Digital Communications Associates, Inc.	
3 <input type="checkbox"/> Farallon Computing, Inc.	
4 <input type="checkbox"/> Microcom, Inc.	
5 <input type="checkbox"/> Microsoft Corp.	

1 <input type="checkbox"/> Norton Lambert Corp.	70
2 <input type="checkbox"/> Software Ventures Corp.	
3 <input type="checkbox"/> Symantec Corp.	
4 <input type="checkbox"/> Triton Technologies, Inc.	
5 <input type="checkbox"/> Walker Richer & Quinn, Inc.	
6 <input type="checkbox"/> Other _____	71
23. Multiplexers	
1 <input type="checkbox"/> Ascom Timplex, Inc.	72
2 <input type="checkbox"/> AT&T Paradyne	
3 <input type="checkbox"/> CASE Communications, Inc.	
4 <input type="checkbox"/> Gandalf Systems Corp./Infotron	
5 <input type="checkbox"/> General DataComm, Inc.	
6 <input type="checkbox"/> Motorola Codex	
7 <input type="checkbox"/> Multi-Tech Systems, Inc.	
8 <input type="checkbox"/> Netrix Corp.	
9 <input type="checkbox"/> Network Equipment Technologies, Inc.	
0 <input type="checkbox"/> Newhridge Networks, Inc.	
x <input type="checkbox"/> RAD-Datcom, Inc.	
y <input type="checkbox"/> RAD Data Communications, Inc.	
1 <input type="checkbox"/> StrataCom, Inc.	73
2 <input type="checkbox"/> Tellabs Operations, Inc.	
3 <input type="checkbox"/> T3 Plus Networking, Inc.	
4 <input type="checkbox"/> Other _____	74
24. Packet Switches	
1 <input type="checkbox"/> Alcatel Business Systems, Inc.	75
2 <input type="checkbox"/> Ascom Timplex, Inc.	
3 <input type="checkbox"/> BBN Communications Corp.	
4 <input type="checkbox"/> BT North America, Inc.	
5 <input type="checkbox"/> Dynatech Communications, Inc.	
6 <input type="checkbox"/> Hughes Network Systems, Inc.	
7 <input type="checkbox"/> Motorola Codex	



NO POSTAGE
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NETWORK WORLD

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1 <input type="checkbox"/> Netrix Corp.	76
2 <input type="checkbox"/> Northern Telecom, Inc.	
3 <input type="checkbox"/> Plantronics, Inc.	
4 <input type="checkbox"/> Sprint International	
5 <input type="checkbox"/> Telematics International, Inc.	
6 <input type="checkbox"/> Tellabs Operations, Inc.	
7 <input type="checkbox"/> Other _____	77
25. PBXs	
1 <input type="checkbox"/> AT&T	80-1
205	
2 <input type="checkbox"/> Ericsson Information Systems	
3 <input type="checkbox"/> Fujitsu Business Communications Systems, Inc.	
4 <input type="checkbox"/> Harris Corp.	
5 <input type="checkbox"/> Hitachi America, Ltd.	
6 <input type="checkbox"/> InteCom, Inc.	
7 <input type="checkbox"/> Mitel, Inc.	
8 <input type="checkbox"/> NEC America, Inc.	
9 <input type="checkbox"/> Northern Telecom, Inc.	
0 <input type="checkbox"/> Rolm	
x <input type="checkbox"/> Siemens Private Communications Systems	
y <input type="checkbox"/> Other _____	06
26. Videoconferencing Systems	
1 <input type="checkbox"/> AT&T	
07	
2 <input type="checkbox"/> BT North America, Inc.	
3 <input type="checkbox"/> Compression Labs, Inc.	
4 <input type="checkbox"/> GPT Video Systems	
5 <input type="checkbox"/> Grass Valley Group, Inc.	
6 <input type="checkbox"/> Harris Corp.	
7 <input type="checkbox"/> Hitachi America, Ltd.	
8 <input type="checkbox"/> NEC America, Inc.	
9 <input type="checkbox"/> Oki America, Inc.	
0 <input type="checkbox"/> PictureTel Corp.	

1 <input type="checkbox"/> Videoconferencing Systems, Inc.	08
2 <input type="checkbox"/> VideoTelecom Corp.	
3 <input type="checkbox"/> Other _____	09
27. Voice Messaging Systems	
1 <input type="checkbox"/> Active Voice Corp.	10
2 <input type="checkbox"/> Applied Voice Technology, Inc.	
3 <input type="checkbox"/> AT&T	
4 <input type="checkbox"/> Boston Technology, Inc.	
5 <input type="checkbox"/> Centigram Communications Corp.	
6 <input type="checkbox"/> Digital Sound Corp.	
7 <input type="checkbox"/> Microlog Corp.	
8 <input type="checkbox"/> Northern Telecom, Inc.	
9 <input type="checkbox"/> Octel Communications Corp.	
0 <input type="checkbox"/> Rolm Co.	
x <input type="checkbox"/> VMX, Inc.	
y <input type="checkbox"/> Other _____	11
28. Digital Private Line Services	
1 <input type="checkbox"/> Advanced Telecommunications Corp.	12
2 <input type="checkbox"/> American Private Line Services, Inc.	
3 <input type="checkbox"/> AT&T	
4 <input type="checkbox"/> Cable & Wireless Communications, Inc.	
5 <input type="checkbox"/> Consolidated Network, Inc.	
6 <input type="checkbox"/> MCI Communications Corp.	
7 <input type="checkbox"/> Metromedia Communications Corp.	
8 <input type="checkbox"/> Sprint Corp.	
9 <input type="checkbox"/> WilTel	
0 <input type="checkbox"/> Other _____	13
29. 800 Services	
1 <input type="checkbox"/> Advanced Telecommunications Corp.	14
2 <input type="checkbox"/> Allnet Communications Services, Inc.	
1 <input type="checkbox"/> AT&T	
15	

2 <input type="checkbox"/> Cable & Wireless Communications, Inc.	
3 <input type="checkbox"/> LCI International	
4 <input type="checkbox"/> MCI Communications Corp.	
5 <input type="checkbox"/> Metromedia Communications Corp.	
6 <input type="checkbox"/> RCI Long Distance	
7 <input type="checkbox"/> Sprint Corp.	
8 <input type="checkbox"/> WilTel	
9 <input type="checkbox"/> Other _____	16
30. Frame Relay Services	
1 <input type="checkbox"/> AT&T	17
2 <input type="checkbox"/> BT North America, Inc.	
3 <input type="checkbox"/> Cable & Wireless Communications, Inc.	
4 <input type="checkbox"/> CompuServe, Inc.	
5 <input type="checkbox"/> Graphnet, Inc.	
6 <input type="checkbox"/> GTE Telephone Operations	
7 <input type="checkbox"/> MCI Communications Corp.	
8 <input type="checkbox"/> Sprint Corp.	
9 <input type="checkbox"/> Wiltel	
0 <input type="checkbox"/> Other _____	18
31. ISDN Services	
1 <input type="checkbox"/> AT&T	19
2 <input type="checkbox"/> MCI Communications Corp.	
3 <input type="checkbox"/> Sprint Corp.	
4 <input type="checkbox"/> Other _____	20
32. Switched Digital Services	
1 <input type="checkbox"/> Allnet	21
2 <input type="checkbox"/> AT&T	
3 <input type="checkbox"/> Cable & Wireless Communications, Inc.	
4 <input type="checkbox"/> MCI Communications Corp.	
1 <input type="checkbox"/> Sprint Corp.	22

2 <input type="checkbox"/> Wiltel	
3 <input type="checkbox"/> Other _____	23
33. Value-Added Network Services	
1 <input type="checkbox"/> Advantage Systems, Inc.	24
2 <input type="checkbox"/> Advantis (IBM Information Network/Sears Communications Co.)	
3 <input type="checkbox"/> AT&T	
4 <input type="checkbox"/> BT North America, Inc.	
5 <input type="checkbox"/> CompuServe, Inc.	
6 <input type="checkbox"/> GE Information Services	
7 <input type="checkbox"/> Graphnet, Inc.	
8 <input type="checkbox"/> Infonet Computer Sciences Corp.	
9 <input type="checkbox"/> MCI Communications Corp.	
0 <input type="checkbox"/> Sprint Corp.	
x <input type="checkbox"/> Other _____	25
34. Virtual Network Services	
1 <input type="checkbox"/> AT&T	26
2 <input type="checkbox"/> Cable & Wireless Communications, Inc.	
3 <input type="checkbox"/> Infonet Computer Sciences Corp.	
4 <input type="checkbox"/> MCI Communications Corp.	
5 <input type="checkbox"/> Sprint Corp.	
6 <input type="checkbox"/> Other _____	27
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COMPANY: _____	
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